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AMERICAN ECLECTIC

MATERIA MEDICA AND THERAPEUTICS.

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~~IN TWO VOLUMES~~.

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A PRACTICAL TREATISE
ON
GENERAL AND SPECIAL THERAPEUTICS.

PREFACE.

IN preparing this treatise on General and Special Therapeutics, the authors have endeavored to present a mass of information, which heretofore has been out of the reach of the general medical reader. We have long felt the want of an elementary treatise on this subject, by the aid of which we could impress what we conceive to be the groundwork of practical medicine upon the minds of our students. It is true much of this information may be found in the elaborate treatises on materia-medica published within the last half-century, but this is in detached portions, and scattered through large volumes, and so associated with special medicinal agents, that it has not its full influence upon the mind of the reader. It has been our object to collect these scattered facts—adding to them the latest inquiries upon the subject, and the results of our experience—arranging them in such a form as to clearly present the *principles* of therapeutics.

We are well aware that this volume is deficient in many particulars; but when the character of the subject is considered—the difficulty of rationally accounting for every thing connected with the administration of remedies, which almost invariably have been at first empirically prescribed, the reader we trust will excuse all the errors of *omission* and *commission*, which we have found it impossible to avoid.

The scope of the work has been to present first, a succinct description of the various theories in regard to disease, and principles of treatment which have grown out of them; hence we have noticed *antipathia*, *homeopathy*, *allopathia*, the *brunonian theory*, the *doctrine of contra-stimulus*, the *chrono-thermal system of medicine* and *hydropathy*. Second, to give a concise description of the pathology of disease, the mode by which nature removes disease when unaided by medicine—

the action of medicine upon the system, the parts to which medicines are applied, the mode in which medicinal agents act when introduced into the stomach, and the art of prescribing medicines. Third, to give a classification of medicines, and accurately describe each class of agents, their action upon the system, why they prove curative, and in what diseases or conditions of the system they are indicated.

It will thus be seen that our field of inquiry has been large — embracing all the points in practical therapeutics, or the treatment of disease, a correct knowledge of each of which is absolutely indispensable to the rational practice of medicine. If we have so presented them to the reader, as to facilitate the study of medicine, we will be abundantly rewarded for our labor.

A PRACTICAL TREATISE

ON

GENERAL AND SPECIAL THERAPEUTICS.

PART I.

GENERAL THERAPEUTICS.

THE term *Materia Medica* embraces all of those agents termed *remedial* or *curative*, which are employed either with a view to palliate or cure diseases. It treats of their natural characters, sensible qualities, chemical properties, and of their mode of action.

Remedies may be divided into two great classes. The first may be termed *psychical* or *mental* remedies, and embraces all those influences which may be brought to bear upon the mind of a person laboring under disease, and which often, if rightly applied, tends much to facilitate a cure. The second may be termed corporeal remedies, and embraces all agents of a curative nature, whether *imponderable* or *ponderable.*

Therapeutics is that branch of medical science that treats of the administration of remedies, and their effects upon the system. Thus, it treats of the changes in function, sensation, or action, wrought upon the system when in a state of disease, by the exhibition of the various agents included under the term materia medica, by which disordered function, sensation or action is subdued. In other words, it treats of the precise steps or series of influences by which morbid phenomena or diseased action is arrested, and health re-established.

In a more extended signification, therapeutics embraces not only the administration and mode of action of remedies, but it likewise takes cognizance of the morbid process existing—the pathology of the disease, the variance from a physiological condition or state of health. Thus says Dr. Dunglison: "To be a good therapeutist, a man must be well versed in every department of medicine, and be capable of observing and reasoning well. He may be a good *observer*, and yet a bad *reasoner*. He can not practice well unless he is both."

METHODS OF CURE.

It is maintained by homeopathists that there are but three possible relations subsisting between the symptoms of disease and the specific effects of remedies. The first is *opposition*, the second *resemblance*, and the third *heterogenity;* consequently there are but three methods of removing disease by the use of medicine, namely: *Antipathic*, *Homeopathic* and *Allopathic.*

ANTIPATHIA.

The *antipathic* method of curing disease consists in the use of appliances or medicines that produce effects of a nature opposed to the symptoms of the disease, and hence the axiom "*Contraria contrariis opponenda.*" Hippocrates entertained these views, and may be regarded as the founder of this doctrine; for says he, "All diseases which proceed from repletion are cured by evacuation; and those which proceed from evacuation are cured by repletion. And so in the rest, contraries are the remedies of contraries."

Much of the practice in vogue at this time is based upon this principle. Purgatives are exhibited to relieve constipation; cold is employed to alleviate the effects of burns or scalds; narcotics to abate pain, etc.

Homeopathic physicians object to antipathic remedies; they assert that, although the primary effects of the agents named may produce phenomena opposed to the disease, yet their secondary effects are similar to those which they are exhibited to remove. They maintain that the primary effect of opium is *constipation*, but its secondary effect *diarrhea;* the primary action of purgatives is followed by *constipation.* These secondary effects do sometimes follow the administration of remedies, though this can not be considered the rule, but the exception. Thus diarrhea is of very uncommon occurrence as a result of the administration of opium; and though constipation may, and often does follow the use of purgatives, yet it is by no means an invariable result.

HOMEOPATHIA.

The *homeopathic* method of practice is that founded by Dr. Hahnemann upon the maxim "*Similia similibus curantur*," or in exhibiting remedies capable of producing effects similar to the disease for the removal of which it is given.

A few of the many examples claimed by the homeopathists as evidences of remedial agents producing effects similar to those of the disease for which they were administered, and by their so-called secondary effects proving curative, may serve to illustrate the doctrine which they maintain to be the only true one.

They assert that white hellebore has cured patients attacked with violent cholera, and yet it caused a disease similar to cholera, when exhibited. In a disease attended with great sweating, which occurred in England, called the "sweating sickness," it was treated successfully only by the use of sudorifics. Purgatives will cure the dysentery; tobacco occasions nausea and giddiness, and relieves the same; senna occasions colic, and is one of the remedies for this disease; ipecacuanha cures dysentery and asthma, because it produces hemorrhage and asthma; belladonna causes a sense of choking and horror of liquids, with fixed and sparkling eyes, and propensity to bite attendants—in short, a disease having the semblance of hydrophobia, which it is said this agent has cured. Opium relieves lethargy and stupor by converting it into natural sleep, and the same agent is a cure for constipation. The vaccine disease protects from small-pox upon the same principle. Cold, either in the form of snow, cold water, or some freezing mixture, is found to be the best application to frost-bitten parts. In scalds or burns, relief is obtained by exposing the part to *heat*, or by the application of heated spirits of wine, or oil of turpentine. We can not better illustrate Hahnemann's views of the action of remedies, than by giving the language of Pereira. "The medicine sets up in the suffering part of the organism an artificial but somewhat stronger disease, which, on account of its great similarity and preponderating influence, takes the place of the former, and the organism from that time forth is affected only by the artificial complaint. This, from the minute dose of the medicine used, soon subsides and leaves the patient altogether free from disease; that is to say, permanently cured."

Hahnemann conceives that the secondary effects of medicines are always injurious, therefore he recommends that no more be given than is absolutely necessary to cure the disease. Proceeding upon this principle, he has reduced the doses of medicines to such a minute state of division, that in many cases no human intellect is capable of appreciating the slightest influence from their administration. Many of them, when exhibited in full or ordinary doses, produce effects scarcely appreciable, and when reduced to the millionth, quintillionth, or even decillionth part of a grain or drop (the usual dose being large, say one or two drachms of the powdered article, or sixty drops of the tincture), how they then can exert any controlling influence over a disease that is grave, if they do so, as is asserted, is a mystery incapable of being solved by finite minds. To give credence to such a doctrine requires a stretch of imagination that we imagine few possess.

The method of obtaining these minute doses consists in reducing the solid to a powder, and mixing one grain of it with ninety-nine grains of sugar of milk—this is called the first *attenuation;* the second attenuation is obtained by mixing one grain of the first attenuation with ninety-nine grains of sugar of milk; and the third by mixing one grain of the second with the same quantity of sugar of milk, as before. In this way Hahnemann proceeds to the *thirtieth attenuation.* Water is the diluent of liquid medicines, and the attenuations are obtained in the same manner—that is, by mixing one drop of the mother tincture or liquid with ninety-nine drops of water, and in this manner continuing the dilutions up to thirty, as in the case of solid substances.

The annexed table shows the strength of the different attenuations:

First attenuation,—one hundredth part of a grain.

Second attenuation,—one thousandth part of a grain.
Third " " millionth " "
Sixth " " billionth " "
Ninth " " trillionth " "
Twelfth " " quadrillionth " "
Fifteenth " " quintillionth " "
Eighteenth " " sextillionth " "
Twenty-first " " septillionth " "
Twenty-fourth " " octillionth " "
Twenty-seventh " " nonillionth " "
Thirtieth " " decillionth " "

The minuteness of the dose is carried to the same extreme, as seen by the following table, as presented by Pereira:

Charcoal, one or two decillionths of a grain.
Chamomile, two quadrillionths " "
Nutmeg, two millionths " "
Tartar emetic, two billionths " "
Opium, two decillionths " "
Arsenious acid, one or two decillionths of a gr.
Ipecacuanha, two or three millionths of a gr.

Such are the doses of the medicines used by this class of practitioners. They are exhibited in the form of pills (pellets or globuli), each pill being about the size of a poppy-seed.

Hahnemann asserts that the longer a powder is triturated, or the more a mixture is agitated, the greater will be the effect of the powder or mixture upon the system; indeed, he found rubbing or shaking develop the inherent virtues of medicines to such an extent, that he says, latterly: "I have been forced, by experience, to reduce the number of shakes to two, of which I formerly prescribed ten to each dilution."

Such are the doctrines, and such an outline of this far-famed system of infinitesimal practice.

The principal facts urged against the doctrine, may be embraced under four heads:

1st. Many of our most certain and valuable medicines do not act homeopathically; sulphur does not produce scabies, nor does cinchona, or any of its preparations, give rise to intermittent fever; and yet these agents are used with great certainty for the removal of the diseases named, and no one questions their utility. Andral took quinia without contracting intermittent,—and who has seen that disease, or one similar to it, follow the use of cinchona? We have often employed it, without ever witnessing such results. It may be urged, however, that the diseased state which previously existed, precluded the development of that disease. Nor have we ever seen scabies follow the use of sulphur; but, perhaps, the homeopathist might say the existence of a previous morbid state acted as a barrier to its occurrence. Acids and vegetable diet cure the scurvy, but they never produce a disease analogous to it.

2d. Pereira asserts that many homeopathic remedies would increase the original disease, as acrids in gastritis, cantharides in nephritis or cystitis, or mercury in spontaneous salivation.

3d. The doses in which these agents are exhibited, are so exceedingly small, that it is difficult to believe they produce any effect on the system, and therefore we would suppose that the reputed homeopathic cures are clearly referable to a natural and spontaneous effort of the system, aided, perhaps, by strict attention to diet and regimen.

4th. Homeopathia has been put to the test in numerous cases, without the least perceptible improvement or change in the nature of the disease, and this under the immediate inspection of some of the most eminent members of that system of practice. "Andral tried it in 130 or 140 patients, in the presence of the homeopathists themselves, adopting every requisite care and precaution, yet in no one instance was he successful." Recently it has been put to the test, in some of the European hospitals, in a large number of cases; a given number of cases being treated homeopathically, and the same number of cases (all being similar) being left to the unaided efforts of the system,—regimen and dietetic rules alone being enjoined,—and the results were not very dissimilar in the two classes of cases.

If these be facts, the *attenuated* system of practice adopted by Dr. Hahnemann, can not be one upon which the practitioner of medicine can place reliance with any degree of confidence in diseases of a formidable character.

Whether we regard the homeopathic system of practice as wholly negative in its effects, or as positively curative, it matters not, so far as its merit is concerned. That it possesses merit, we do not feel at liberty to deny; but whether of a positive or negative character, is a question about which there is much dispute. So far as the rules of dietetics, as enjoined by homeopathists upon their patients are concerned, we have never seen any that surpassed, if, indeed, equaled, those which they have adopted. And so far, all will admit that their system of medication is positively useful and curative; and may we not inquire, is not much of the success which they claim for their practice, to be fairly and justly ascribed to this cause? Does not that rigid regimen, that scrupulous avoidance of every article of diet of an oppressive or indigestible character, leave nature free to act, and does it not invite her to assert her own prerogative?—does it not leave the *vis vitæ*, the *vis medicatrix naturæ* unoppressed, unobstructed, and independent, by which her powers rally, and she throws off disease, and abnormal action is arrested? May we not reasonably account for many cures in this way? We think it is not unreasonable to award much credit to this system of practice, upon the grounds above named. Then if it be not regarded as positively curative in this respect, so far as a system of medication is concerned, yet it is important for the reason that it leaves nature free to act and rid herself of disease, and is, therefore, to be regarded as a highly valuable mode of *negative medication.* Do we not daily see febrile and inflammatory diseases relieved in this way, without a particle of medicine; every one of common observation knows this to be an indisputable fact. How often do we see many of the most obstinate diseases relieved by the unaided efforts of the system. We have often seen patients recover, who we believed to be dangerously ill, but who, from an aversion to drugs, a fear of poisonous agents, penuriousness, or some other cause, did nothing of an active character. Then may we not truly say, nature is all-powerful in throwing off disease. If, then, nature effectually eradicates a vast number of diseases, and those that baffle the skill of the most experienced physicians, even when called at an early hour in their course, and aided by the best of care, may we not reasonably conclude that recoveries would be very numerous if no physician of any kind was called, and no medicine administered.

May we not reasonably and justly conclude, from what has been just stated, that the *attenuated* form of medication — the *infinitesimal doses*, often receive credit when none should be awarded to it; that their influence is imaginary, and not real; that they exercise no positive curative agency in many, perhaps not in any case in which they are administered, but in which it is ascribed to them; that their effects are *negative*, and that the powerful influences, benefits and advantages, claimed to follow from the exhibition of the millionth or decillionth part of a grain of *charcoal, common salt*, or of *silex*, or *sand* (and all other agents when administered in a form so attenuated), and carried out according to the doctrines of Hahnemann, are but an imposition on the credulity of the people, which must be apparent to any one who investigates the subject. Does it not seem to be practicing upon the *expectant* plan wholly? Does it not seem to be a mere *placebo*—the *bread-pills*, or *colored-water* exhibited in a new form. To believe that a dose of the most simple agent, so minute that it is entirely beyond the conception of the human mind, exercises such a powerful control over the human system when in a state of disease, requires an imagination so acute (it seems to us) as it falls to the lot of but few mortals to possess. As well may we imagine that the millionth or decillionth part of a grain of our daily sustenance, taken three times a day, will be sufficient to sustain life; that it will support the wants of the animal economy, and maintain all the varied processes of secretion, excretion and innervation, as that a similar amount of salt, charcoal, etc., will effect great sanative changes upon the human body when in a state of disease.

Although we can not repose confidence in the Hahnemannian system of medication as a whole,—as a *positively curative* system,—but must regard it as a *negative* one, yet we are fully satisfied it will be of great good to the medical profession, and to mankind generally. We have long since been fully persuaded that too much medicine was used—that the patient was too frequently and too largely dosed with drastic, corrosive, or poisonous drugs, without any definite object or well-defined reason in view on the part of the physician. Less medicine will be found to be to the advantage of patients, and physicians will learn from the homeopathic system to administer it in smaller quantities, to give it less frequently and with a definite object in view, and above all, to *repose more confidence in the recuperative powers of the system,* when untrammeled by the use of nauseous, and often oppressive and disease-creating drugs. In this light we view homeopathy as positively advantageous, and as calculated to bring about, or aid in bringing about an important reform in the practice of the healing art.

We regard the principle of "*Similia Similibus Curantur,*" as laid down by Hahnemann in the administration of medicine, as true in some cases, but not as being an infallible or invariable rule, by which the physician is to be governed in all cases. Disease was treated upon this principle long before the day of Hahnemann; but when disease is treated in accordance with this axiom, the remedy, in order to prove effectual, must be given in sensible doses.

ALLOPATHIA.

The allopathic or heteropathic method of cure is based upon the exhibition of remedies which produce phenomena neither similar to, nor exactly opposite to those of the disease. It consists in curing disease upon the axiom "*Contraria Contrariis Curantur.*"

By this mode, a cure is effected by *counter-irritation* or *antagonism;* in other words, by establishing an artificial or secondary disease that shall displace the primary one. This practice is based upon the influence which one disease is known to exert over another; as, for instance, the supervention of diarrhea during the progress of some other disease, with a subsidence of the original disease, apparently the result of the diarrhea. Occurrences of this kind undoubtedly first prompted the use of agents producing alvine evacuations in similar cases. Cutaneous eruptions sometimes appear and are soon followed by the disappearance of an internal disease existing at the same time; and the disappearance of the eruption is often followed by some internal disorder. These occurrences then point to the use of blisters and other revulsives, with the view of establishing an artificial disease.

One disease seems to modify another, then, by establishing a new point of excitation—an artificial disease; thus by securing an increased nervous and vascular afflux to that part, the original disease is modified or subdued. The maintenance or duration of the primary disorder depends upon the concentration of nervous and vascular afflux to the part secondarily affected; now it is evident that if a new point of excitation is established, in proportion to the concentration there, or to its localizing influence, must be its power to derive from and weaken the force of the original disease.

Many of our medicinal agents prove curative, by exciting a stronger irritation than exists at the location of the primary disease, the effects of the remedies being produced in another part of the system, and in a different tissue. There are but few remedies but what act to a greater or less extent in this manner. Thus all the appliances brought to bear upon disease, make new impressions, modify the old ones, and change the sensation, action, or function of some organ, tissue or part, by which the original morbid condition is altered or subdued; in other words, they exert a relative influence over disease, or cure it by *conversion*, or by the production of a new pathological state that subsides as soon as the action of the agent ceases its operation.

In the present state of our knowledge of the action of remedies, and the laws governing the animal economy, we can give no satisfactory theory or hypothesis of the manner in which this cure by revulsion or counter-irritation is accomplished. Dr. Parry advances the theory that most diseases consist in, or are attended with local determination of blood, and that it is a law of the human constitution that excessive morbid determination to two different parts shall not exist in the same person at the same time. This will not explain, however, even admitting the proposition, why the secondary excitation and determination detracts the circulation from and relieves the parts primarily irritated. Again, we have attempts to account for it, by the supposition that the system only generates a certain quantity of nervous force in a given time; in disease, the part affected receives much more than its normal proportion, and by a secondary excitation this surplus is determined to the point last affected, and thus the original disease is much mitigated.

These are hypotheses which it would be unprofitable to pursue further, but we may notice with much advantage the laws which appear to govern the action of such remedies as come under this head, and which affect the secretions. These have been arranged by Müller as follows:

1. The increase of a secretion in a tissue, *a*, which is less irritable than the organ *b*, is incapable of producing a diminution in the secretion of the latter; hence, for example, artificially excited secretions from the skin, as by a blister, in the neighborhood of the eye, in inflammation of the latter organ, are of no service, because the eye is a more irritable part than the skin.

2. An increased secretion in a certain tissue, *a*, can not be diminished by exciting the same secretion in another part of the same tissue, *a;* on the contrary, such a procedure would rather increase the secretion from all parts of the tissue than diminish it, because the relation which exists between the different parts of one and the same tissue is that of sympathy, not of antagonism. Hence, a discharge from the generative or urinary organs can not be arrested by an artificially excited diarrhea.

3. On the contrary, the secretions of tissues which do not belong to the same class of structures often antagonize each other. Thus, increase of the cutaneous secretion frequently induces diminution of the secretion of the kidneys. In summer, the cutaneous exhalation is more abundant, and the urinary secretion proportionably scanty; in winter, the reverse is the case. Effusion of watery fluids into the cellular membrane and serous cavities is attended with dryness of the skin and diminution of the urinary secretion, the quantity of which is observed to increase in the same proportions as dropsical effusions diminish. Suppression of the exhalation of the skin by cold gives rise to mucous discharges from the intestinal and pulmonary mucous membranes.

4. It is only toward the termination of consumptive disease that this relation of antagonism between the secre-

tions ceases to exist; when, in consequence of the relaxed state of the tissues, all are at length increased in quantity. In the colliquative state that precedes death in phthisical patients, colliquative diarrhea, profuse sweating, and dropsical effusions take place simultaneously.

5. When one tissue is excited to increased action by an mpression made upon another, either the secretion of the two must have been in some respects similar, as in the case of the skin and kidneys, both of which have the office of excreting water from the blood; or the organ thus excited must have had a predisposition to morbid action, which is the rational explanation for the circumstance that the impression of cold produces in one person an affection of the mucous membrane of the lungs; in another a disordered secretion of mucus in the intestinal canal.

Brunonian Theory.

Dr. John Brown maintained the doctrine that all living beings are endowed with a peculiar principle, which he terms *excitability*, and that serves to distinguish them from inanimate bodies. "The agents which support life are termed *exciting powers*, and these, acting upon the *excitability*, maintain life; in the language of Brown, they produce the effect called *excitement*." Those agents that modify the excitability, and produce a greater or less degree of excitement, are termed *stimulant powers;* these are either *universal* or *local.* When the exciting powers act moderately, *health* is produced; when they act with too great energy, they cause *indirect debility.*

He arranged all diseases under the two divisions of *sthenic* and *asthenic*, and maintained that all remedies acted as *stimuli;* so that we had only to increase or diminish their force according to circumstances, for they differed from each other in little more than the degree with which they exerted their stimulant power. He also maintains that they could not cause exhaustion of the excitability except by excessive action, or by producing previous over-excitement.

In answer to this theory, it may be said that many, perhaps all of the narcotic and sedative agents produce exhaustion, without occasioning any apparent excitement previous to this effect. Such is the case with digitalis, hydrocyanic acid, and many other agents that might be named. It is utterly impossible to ascribe death (when they occasion it) to any previous excitement which they produce. Agents which prove most destructive to life, seem to exert the least excitant influence over the animal economy. It can not be said that agents which exert no obvious excitant influence over the system, or those which produce no immediate or unmistakable impressions upon the organs of our bodies, are less curative, or produce less mistakable effects upon the system, than those that possess clearly excitant powers.

The great majority of our medicines, says Pereira, act neither as stimulants nor sedatives merely; they alter the quality of the vital actions, and this alterative effect has been quite overlooked by the Brunonians.

Doctrine of Contra-Stimulus.

This doctrine is but a modification of the Brunonian theory. It was first advocated by Rasori and Borda, and subsequently by Tomasini and other distinguished Italian physicians. According to this doctrine, there are but two classes of medicines—*stimulants* or *hypersthenics*, and *contra-stimulants* or *hyposthenics.* "The first exalt, the second depress the vital energies."

This hypothesis obviates one of the objections to the Brunonian theory, since it recognizes agents that do positively possess the property of reducing vital action. From these positions it will be seen that contra-stimulants, or depressing agents, are indicated in all cases of exalted organic action; and stimulants are demanded in all depressed states of the vital forces. Although the general principles of this doctrine are correct (providing we take a correct view of the pathology of disease), yet the deductions drawn from them are fallacious in many respects. Wine and other alcoholic liquors are stimulant, and to relieve the inebriation which they occasion, *contra-stimulants*, say the advocates of this theory, must be employed; yet who uses the digitalis, or hydrocyanic acid, to relieve that state of torpor which those liquids produce? Or do those who are in the habit of resorting to the use of tartar-emetic and the lancet, in high febrile or inflammatory action, employ them to relieve intoxication?

Many agents denominated contra-stimulants, act locally and primarily as stimulants, as in the case with the majority of cathartics. Some of the narcotics (as the opium) act primarily as stimulants, and secondarily as sedatives, providing the dose is sufficiently large. Many agents, and even whole classes of remedies, exert neither a primary stimulant, nor a secondary contra-stimulant influence over the organs of the body, to which we can ascribe their curative powers. This is especially the case with tonics, astringents and alteratives. The advocates of this doctrine are by no means agreed as to the action of certain agents, for some regard cinchona as stimulant, and others as contra-stimulant.

Cold is the most powerful contra-stimulant, if carried to excess, and yet how vigorous the reaction, how violent the inflammation that often follows its moderate application to the system. From this it will appear that the broad ground of *stimulant*, or *contra-stimulant*, as advocated by them, and as applied to therapeutic agents and influences, is based upon an erroneous foundation. Agents the most dissimilar and opposite in their effects are grouped together, while those possessing analogous properties are separated by the founders of this doctrine. "They judge of the nature of a disease," says Pereira, "by the effect of the curative means, and of the virtues of medicines by the nature of diseases. So that if a disease now supposed to be sthenic, should hereafter prove to be asthenic, the medicines used to relieve it would immediately pass from the class of contra-stimulants to that of stimulants."

As fallacious as are these doctrines, one truth has been derived from this source, and this is the *tolerance* of large quantities of some remedies by the system, when laboring under disease. In febrile and inflammatory action, when the grade of excitement is high, patients can bear much larger doses of some agents without causing evacuations, than under other opposite states of the system. Under the circumstances named, much larger doses of emetic or cathartic substances are required to produce their ordinary effects, than when the grade of excitement is less vehement.

From this it appears that the state of excitement increases the *tolerance* of the remedy.

CHRONO-THERMAL SYSTEM OF MEDICINE.

The system of medicine advocated by Dr. Samuel Dickson, styled the *Chrono-Thermal*, assumes the position that all disease is a *unit;* that *unity of morbid action is the type of disease;* that this morbid action in all diseases is *one* and *identical*, and that this is *intermittent fever;* in other words, all diseases assume periodicity.

In presenting an epitome of this system of medicine to our readers, we can not do better than to make such extracts from the writings of Dr. Dickson as will give a clear idea of his views. The doctrines advanced by him, though peculiar, convey much truth, and we can not but think that their perusal will gratify and prove instructive to our readers.

The following are the positions assumed by Dr. Dickson on the subject of health and disease:

1. The phenomena of perfect *health* consist in a regular series of alternate motions or events, each embracing a *special period* of time.

2. Disease, under all its modifications, is, in the first place, a simple *exaggeration* or *diminution* of the amount of the same motions or events, and being universally alternative with a *period* of comparative health, strictly resolves itself into *fever—remittent* or *intermittent*, *chronic* or *acute;* and all local affections, or structural lesions, occurring during its progress, are but incidental occurrences, not original maladies.

Dr. Dickson terms all remedies "*chrono-thermal*, from the relation which their influence bears to *time*, or *period*, and *temperature*."

Disease, according to this system, is much simplified, and is amenable to a principle of *treatment* equally simple. A disease partakes of the nature of *ague* throughout all its modifications; those agents best calculated to relieve that disease, according to this theory, will be found most effectual in removing the same disease when it presents itself under some of its diversified forms, although not recognized ordinarily as being allied to *ague*.

Hippocrates announced, says Dr. Dickson, more than twenty-three centuries ago, the unity of morbid action, and that the type of all disease is *one* and *identical*. These positions Dr. Dickson maintains with great enthusiasm, and proposes to prove "*the unity of all morbid action, and the unity and identity of the source of power of various agencies, by which disease of every kind may be caused or cured.*"

Disease is an error of action, says he; a greater or less variation in the motion, rest and revolutions of the different parts of the body, reducible, like the revolutions of *health*, into a systematic series of periodic alternations, in the course of which the matter of a structure occasionally, by its atomic changes, alters its natural character and chemical relations; so much so in some cases, as to become even completely decomposed and disorganized.

Again he remarks: "The human body, whether in health or disease, is an epitome of every great system in nature. Like the globe we inhabit, it has in health its diurnal and other variations—its sun and shade—its times and seasons—its alternations of heat and moisture. In disease we recognize the same—long chills and droughts—the same passionate storms and outpourings of the streams, by which the earth at times is agitated—the matter of the body assuming in the course of these various alterations, changes of character and composition, such as abscesses, tumors and eruptions, typical of new forms, as mountain masses, earthquakes and volcanoes. All these, too, like the tempests and hurricanes of nature, *intermitting*, with longer or shorter periods of tranquillity, till the wearied body either regains, like our common mother, its wonted harmony of motion, or like what we may conceive of a world destroyed, becomes resolved into its pristine elements."

"The actions of life in health are all, as you have seen, *periodic*, and however, or by whatever caused, their morbid modifications, termed disease, are periodic also."

Although he assumes that *ague* is the type of all diseases, yet he accounts for the differences met with in the different forms of disease, by saying that all [illegible] equally perfect. The different stages [illegible] duration; the bolder features [illegible] or less subdued; the intermission, or immunity from suffering, instead of extending to a day, or days, may be only an hour or two in duration. This disease is now no longer *ague.* Physicians change its name to *remittent fever.* All the different grades of fevers—as *remittent, continued, typhus*—as well as the innumerable varieties of other diseases, are but shades or modifications of the same disease, although christened or baptized by a new name.

"Call the symptoms *ague, fever,* or what you please, *constitutional disturbance* is the prelude to every disease, the precursor of every kind of local mischief; though in numerous cases, if not in all—more especially after repeated paroxysmal recurrence—*superadded phenomena* appear, and these last may be either *functional* or *organic*—and in some instances they are of a kind so grave and important as to throw the constitutional symptoms for a time altogether into the shade. Some part of the system, in a word, may be so much more prominently implicated than another, as to become the chief feature of the case—*functionally,* if the *motions* be only *anatomically* altered—*organically,* if the part in question be threatened with a change in its structure tending in any way to its destruction or decay."

"The causes of all disease can only affect the body through one or more of the various modifications of *nervous perception.* No disease can arise independent of this; no disease can be cured without it."

Among the agents which he styles *chrono thermal,* and occupying a prominent rank, is the cinchona. This agent he regards as valuable in gout, rheumatism, scrofula, scurvy, diseases of the bones, gangrene, etc., as well as in a multitude of other diseases assuming periodicity, and he refers tc corroborating testimony to sustain his position. Prussic acid is next in importance to the bark—this he esteems exceedingly valuable. Opium and the salts of morphia occupy the third rank in the list of chrono-thermal agents, and next to them alcohol, wine, and malt liquors are noticed. These act beneficially, or the reverse, says he, in no other manner than by changing the temperature of the brain.

[illegible] valerian, camphor, silver, zinc, arsenic, asafœtida, nux-vomica, strychnia, iron, copper, with a large number of agents from the vegetable kingdom not noticed in this place, with various other appliances, are all denominated chrono-thermal remedies. They are employed with a view to destroy the periodic character of all diseases, and with a view of expelling them from the system.

Such is an outline of the *chrono-thermal* system of practice; and although some of its features do not accord with the doctrines now styled orthodox, yet there is some truth in them. Upon taking a general survey of the innumerable diseases to which our bodies are subject, every one must see at once the tendency there is to exacerbations and remissions, thus constituting the periodicity which Dr. Dickson maintains all diseases assume. The periodic character of many being irregular as to time, intensity, duration, etc., does not seem to militate against the doctrine in question. The fact that exacerbations and remissions do occur, although irregular, goes far to prove the truth of one proposition of our author. As to the agents used, it may be questioned whether all those named, and those in general use act as antiperiodics. It may be said, however, that they lessen exalted organic action, and subdue or break down the exacerbation, and thus exhibit their claim to be ranked with *antiperiodics*.

HYDROPATHY.

Although the "*water-cure treatment*" had been employed to a limited extent as an auxiliary remedial measure long anterior to the days of Priessnitz, yet to him belongs the credit of introducing it into general use as an independent curative system.

As an independent course of treatment (all drugs being ejected), we think it erroneous; but as an auxiliary to other means of cure, there is no doubt but that it is one of the most efficient that can be adopted.

The efficacy of hydropathy is fully recognized by Dr. Pereira, who remarks: "The cold-water cure, or hydropathy, though not yet admitted, by the medical profession, among the legitimate means which may be beneficially employed in the treatment of diseases, undoubtedly includes powerful therapeutic agents." He further says: "It does not confine itself to the use of cold water only, but includes dry sweating, diet, exercise, and regulated clothing."

Prof. Carpenter remarks that the hot-air bath, in some cases, and wet sheet, as used by hydropathists, act powerfully as diaphoretics, and will probably be more extensively employed, as the importance of acting on the skin, as an extensive collection of glands, is better understood.

Prof. Williams says: "The reaction which follows the judicious use of cold, as a therapeutic agent, may prove serviceable not only in resisting the further influence of cold, but also to remove congestions and irregularities in the circulation from other causes, and to excite in the capillaries and secernents, new actions which may supersede those of disease."

Dr. Edward Johnson, in his work on hydropathy, says: "In examining the subject of hydropathy, we are first to consider it as one great whole, consisting of many parts, as the wet-sheet packing, the blanket packing, the dry sweating, the vapor sweating, cold baths of various kinds and different degrees of power; clothing, systematic exercise, and regulated diet. In inquiring into its mode of action, therefore, we must first look to its general effects as *one whole.* These, I presume, will not be disputed by any one. They are to strengthen the digestive functions; to cool the system; to increase the appetite; to allay excitement; to purify the blood; to strengthen the muscular fiber of the heart; to quicken the action of the skin (which is to the hydropathic treatment what the stomach and bowels are in the drug treatment; to overcome internal congestions; to restore and augment all the secretions and excretions; to accelerate the *change of matter*, and thus renovate the tissues of all the organs, and to invigorate the vital principle."

Again, Mrs. Nichols remarks: "It prescribes a pure and healthy diet, carefully adapted to the assimilating powers of the patient; it demands pure air and strengthening exercise, with other moral hygienic conditions. The applications of water, according as they are made, are cleansing, exciting, tonic, or sedative. Water clears the stomach better than any other emetic, produces powerful and regular evacuations of the bowels, excites the skin—the great deterging organ of the system—to throw off masses of impurities, stimulates the whole absorbent and secretory systems, relieves pain more effectually than opium, dissolves acrid and poisonous matters, purifies the blood, reduces inflammation, calms irritation, and answers fully all the indications of cure; to fulfill which, physicians search their pharmacopeias in vain. The proper application of the process of the *water-cure* never fails of doing good. Its only abuses come from ignorance. The water-cure physician requires a full knowledge of the system, and a careful discrimination in applying it to various constitutions, and the varied conditions of disease." Hydropathists are opposed to all medicines, at least many of them. "Unassisted nature, where there is a large stock of vitality, may triumph over both disease and medicine. The success of the homeopathic practice shows, that the less medicine taken, the oftener nature asserts her rights. But the *water-cure* equalizes the circulation, cleanses the system, invigorates the great organs of life, and by exciting the functions of nutrition and excretion, builds up the body anew, and re-creates it in purity and health."

For medicinal purposes, soft, fresh, pure spring water is always to be preferred. Lime-stone water, or water containing saline matter in solution is not so good, and even soft water—as rain-water, if it has been standing in tanks or cisterns—is less beneficial.

The modes in which water is employed as a remedial agent are numerous; we may notice, with advantage, the *plunge-bath*, the *pouring-bath*, the *dripping-sheet*, the *douche*, the *sitz-bath*, the *wet-sheet pack*, and the *blanket-pack*.

The *plunge-bath* consists in immersing the entire person in the ordinary bathing apparatus. In all cases the head should be wet before applying the water to the surface.

The *pouring-bath* consists in applying a suitable quantity of water to the surface, by expressing the water from a sponge, or by pouring it from a suitable vessel upon the body.

In using the *dripping-sheet*, the entire body is to be enveloped in a sheet dipped in cold water while the patient is standing; at the same time rubbing him briskly outside of and with the sheet. This bath is much prized in febrile diseases, but it is obviously inappropriate when the patient is much reduced, or in the advanced stages of disease.

The *douche* is applied by dashing cold water upon the surface of the body, or by directing a stream or jet of water from a force-pump, or by an affusion of water from a hight varying from five to twenty feet, letting it fall on different parts of the body; the full force of the douche not being allowed to fall upon the head. This is powerfully excitant, and often proves eminently serviceable in certain forms of chronic disease, as in spinal and nervous affections, in tumors and rheumatic swellings, as well as in many other cases.

The *sitz-bath* is a highly efficacious mode of applying water in some diseases. It consists in seating the patient in water at first tepid, but by degrees diminishing the temperature to its natural standard. The water should completely cover the pelvic region, which may be done in the absence of the proper *sitz-bathing apparatus*, by substituting the ordinary wash-tub, with a suitable amount of water. It is employed as an excitant and tonic to the pelvic viscera and bowels, and as a derivative in diseases of the brain and superior parts of the body.

The *shallow* or *half-bath* is similar to the other; the patient is seated in shallow water (say three or four inches deep), and rubbing the body, or being rubbed by an attendant. It is esteemed beneficial in febrile and congestive states of the system.

The *wet-sheet pack* is said to be the most powerful and universally applicable mode of applying water in the cure of disease, and consequently has been denominated the *sheet anchor* of hydropathic practice. It is extensively employed in nearly every variety or stage of disease. It is especially useful in febrile diseases, to diminish the excessive heat of the surface, lessen exalted action, equalize the circulation, promote perspiration, relieve pain, subdue spasms, remove obstructions, and secure tranquillity, which is usually succeeded by a profound and refreshing sleep. It consists in spreading one or more comfortables and two or more blankets upon a bed or mattress, over which a sheet that has just been dipped in cold water and wrung until no more will run from it, has been spread. Upon this the patient is to be placed, being divested of his clothing, and the wet sheet wrapped closely around the body, so as to bring it in contact with every part of the surface, the face excepted. Then the blankets are to be tightly wrapped around him, and over these comfortables, blankets, or a light feather-bed may be thrown. If very weak or chilly, heated bricks or bottles of hot water may be applied to the armpits and to the feet. If the reactive powers of the system are sufficiently strong, artificial heat is to be avoided. If the head ache, a towel dipped in cold water is to be applied. In this condition the patient should remain until reaction is complete, and warmth fully established. In most cases the patient sweats freely. If uneasy and nervous, the covering may be removed at any time, when immersion or affusion of cold or tepid water should be immediately resorted to. This rule is not to be violated, except in high grades of inflammatory action, when one wet sheet after another is to be applied in quick succession.

The *blanket-pack* consists in the application of dry blankets, instead of the wet sheet, until perspiration is excited, when some one of the cold baths is to follow, succeeded by brisk frictions with the coarse towel, flesh brush, or dry hand, in order to excite the skin and produce a healthy and vigorous reaction. If the strength will admit, he should rub himself vigorously in all cases.

Upon reflection, no medical man can fail to award great therapeutic powers to water, in the various modes in which it is used. The dietetic rules adopted by hydropathists, with well-regulated exercise, clothing and bathing, are capable of exercising a most powerful influence over all the varied functions of life.

Ablutions, affusions, etc., when applied to the surface in febrile and inflammatory states of the system, serve to depress the exalted action, act as sedatives to the circulation, diminish the temperature of the body, promote perspiration, and break up that morbid association of action upon which the continuance of disease seems often entirely to depend.

It is also a very powerful means of revolutionizing the system in chronic affections. The shock, the new and powerful impression which it imparts to tens of thousands of nervous fibrilla and capillary vessels, spread out on that extensive, highly sensitive and strongly sympathizing tissue, the skin, is indeed great, and we must at once recognize the utility and immense importance of these applications to the surface. The shock which it imparts to the whole nervous system is calculated to secure a vigorous reaction, if properly applied; to arouse all the secretory and excretory organs of the body, impart new vigor and energy to languid and atonic organs, augment muscular and nervous activity and power, and yet calm irritated action, and secure tranquillity when the nervous and muscular equilibrium is interrupted. In these ways it increases the vital forces, and stimulates the recuperative powers of the system; hence it may be said to be one of the most important alteratives and tonics of the materia medica.

We have thus given a synopsis of the most prominent theories advanced upon the subject of practical therapeutics. In each of these we find some truths, but in all much error. The main difficulty with all of them appears to be that their originators did not pay sufficient attention to the facts of pathology, or if they did this, that their reasoning was based upon the action of remedies that we would not consider curative under any circumstances.

To properly understand this subject, it is necessary that we fully understand the pathology of disease, the reasons why the system, or a special organ, deviates from its normal healthy action, the causes that produce this, and the changes in structure that are occasioned by it. Knowing this, we should then carefully observe the means by which nature removes diseases, recollecting that the all-wise architect who formed our bodies to meet every requirement of our existence, was not forgetful that they would be subject to disease. *Can man be more wise than his Maker?* If he can not, why then should he try to add something to that which was before perfect; why should he try to create new eliminating organs, to make a laboratory of a man's sanguineous system, trying by means of poisonous chemical agents to counteract a *materies morbi* of which he knows nothing? In the next place, the therapeutist should carefully choose such means as will assist nature in relieving herself of disease, by acting in the same manner and exciting the same parts and organs, as do relieve the system of the morbific matter, when the natural powers of the system are the physician.

We would strongly impress it upon the mind of the reader, and especially upon the student, that no man ever yet cured a disease, nor ever will. All that any can do is to assist nature in effecting a cure. How often do we hear physicians talk of healing wounds, as if the entire process depended upon their skill, when, with their utmost efforts, they could not produce a single cell, fiber, or even a fluid similar to the coagulable lymph which is the basis of repair.

What then is the province of the physician? The following propositions, laid down by the eminent German physician, Hufeland, express our views of it:

1. Art sometimes can take away the whole disease by removing the exciting cause, and so dispense with the internal curative process of nature, e. g., by removing a foreign body, a poison, a gastric accumulation which produces the disease, etc.

2. The vital power is sometimes too exalted, and its operations too impetuous and violent;—so much so, that it may consume itself or injure noble organs. Here art can effect that degree of reduction and depression which is requisite to bring on a perfect crisis, and to prevent dangerous occurrences.

3. On the other hand nature may not have sufficient power, to perform the internal curative process. Here art interferes, raises and makes up, by suitable and strengthening remedies, the deficiency; and thereby only renders the internal cure possible.

4. Art can remove obstacles, which render the curative process of nature difficult or impossible. Under this head falls the important point of a proper diet, quietness in febrile diseases, guarding from the influence of impure air, injurious aliments and the like.

5. Art can support nature in combating particular forms of disease, by appropriate remedies conformable to the m

6. Art can assist nature in the commencing crisis,

bring it to perfection.

7. Finally, there are morbific matters and conditions of which unassisted nature can not get rid, e. g., the syphilitic virus, mechanical lesions, etc. In such cases the assistance of art is indispensable, either for improving the quality of that matter by means of agents counteracting its virulence, or for lending mechanical or surgical assistance.

Such is the province of the art of healing, and such are its limits. The physician must not pretend to be *magister*, but *minister naturæ*, her servant or rather assistant, her ally, and friend. He is to go with nature hand in hand; and in performing his great task, he is not to forget that it is not he, but nature that operates;—regard nature, be always guided by her, and never interfere to disturb her.

With this introduction we propose to give our views of therapeutics, and in doing this we shall consider it under the three heads named above. First, the general *pathology* of disease. Second, the means by which nature removes disease. And third, the mode in which agents act upon the system.

DISEASE.

Disease we define to be any deviation from the normal physiological condition of the entire system—constituting general disease, or of some particular organ or part, constituting local disease. This deviation always involves a change of structure either in the fluids or solids; for no action can be produced in the normal condition of the system without a normal change of structure in the tissues of the body—the change of structure being the cause, the action the effect of that cause; then to account for the morbid actions in disease, we must first suppose a morbid change of structure. We may then divide disease into general and local.

But before considering these two classes of disease, it will be advantageous to take a glance at the forces which act upon the materials of which the body is composed, producing all the varied actions of the system both in health and disease. In the human body, as well as in all living organisms, we recognize two [illegible] distinct kinds of force, which are antagonis[illegible] [illegible]se have been named the vital an[illegible] [illegible] the single cell builds up the entire organism; separates from the nutritious materials furnished it, those portions which form the different organs of secretion, excretion and innervation; supplies the waste of the tissues, and tends to keep the body intact.

But in the chemical force, we recognize the cause of the waste of the body, the disintegration of the tissues, the change of matter from a higher to a lower grade of organization, and all the retrograde tendencies in the body—from a state of health to disease and death.

Health then consists in the maintenance of the proper equilibrium between the vital force which builds up the system and the chemical force which causes disorganization. Life itself is a forced state of being caused by a preponderance of vital force; every atom of the body having a constant tendency to revert back into its original elements. This change taking place in the entire body produces *death;* in but a portion of the body it produces *disease.*

Then any cause which diminishes the *vital* force, thereby giving a preponderance to the *chemical,* becomes a cause of disease; or any cause which increases or gives greater intensity to the chemical changes going on in the body also becomes a cause of disease—providing these changes are not antagonized by the vital force.

General Disease.

There can be no doubt but that the seats of general diseases are in the fluids of the body, and that all phenomena that are manifested by them, grow out of changes which are primarily produced in the blood. This will be more apparent when we reflect that no other component part of the organism can be compared to the blood, in respect to the feeble resistance which it offers to external influences. The blood, says Liebig, is not an organ which is formed, but an organ in the act of formation; indeed it is the sum of all the organs which are being formed. The chemical force and the vital principle hold each other in such perfect equilibrium, that every disturbance however trifling, or from whatever cause it may proceed, effects a change in the blood. This liquid possesses so little permanence, that it can not be removed from the body without immediately suffering a change, and can not come in contact with any organ in the body without yielding to its attraction."

"The slightest action of a chemical agent upon the blood exercises an injurious influence; even the momentary contact with the air in the lungs, although effected through the medium of cells and membranes, alters the color and other qualities of the blood. Every chemical action propagates itself through the mass of the blood (and thus makes the disease general); for example, the active chemical condition of the constituents of a body undergoing decomposition, fermentation, putrefaction or decay, disturbs the equilibrium between the chemical force and the vital principle in the circulating fluid. Numerous modifications in the composition and condition of the compounds produced from the elements of the blood, result from the conflict of the vital force with the chemical affinity, in their incessant endeavor to overcome one another."

We hold therefore that humoral pathology, so far as general disease is concerned, is simply a requirement of common sense—the facts upon which it is founded being fully proven, both by organic chemistry and pathological anatomy. The first shows us that the fluids of the body are the parts most readily changed by causes of disease, and that these changes do actually occur. It is proved by morbid anatomy, from the fact that the lesions of the solids found are inadequate to account either for the phenomena of disease, or its termination, death; and it has therefore been compelled to look to the fluids for the cause, and in this investigation the facts that we have laid down have been fully established.

Diseases of the blood mass may consist either in an excess or defect in the normal constituents of that fluid, in a change in the composition of some of its elements, or in the presence of a morbid matter either generated within the system or introduced from without.

Excess of the normal constituents of the blood is rarely if ever a cause of disease, without indeed we should consider the increased quantity of fibrine in inflammatory diseases, as an instance of this kind; or the constituents of the urine, urea, uric acid, etc., as elements always found in the blood.

Defect of some of the constituents of the blood is of common occurrence; and thus we may have a defect in the quantity or quality of the red globules, the albumen, fibrin or the *salts*. A defect either in quality or quantity of any of these constituents "is disease," and being located in the fluid that furnishes nutritive material for the entire system, the entire system suffers in proportion to the constituent affected, and the change in quantity or quality that it has undergone.

The presence of a *morbid material* in the blood is the most frequent cause of general disease; this morbid material may be either generated within the system, and retained, or it may be introduced into the circulation from without. What are we to understand by the term *morbid material?* We would define it to be any substance of a lower degree of organization than the blood — an organized body which has already begun to decay, such a body as we know will act as a diastase in the blood, effecting a similar destruction in every molecule of the blood that has not sufficient vital power to resist this change.

We have first to consider the retention of such a material in the blood, it having been generated within the body. As we have before stated, every action performed in or by the body, requires the disintegration of some portion of the tissues, this disintegration being a change from a higher to a lower degree of organization — a process of decay. This disintegrated and decaying matter is received into the blood; but not being suited to the wants of any part of the system, is thrown out of the system by organs especially formed for this purpose; the principal of these being the *skin*, *kidneys*, and lower *portion* of the *intestines;* to these we may add the *liver* as it excretes a noxious material from the blood, though this is of still further use in the economy.

Suppose for instance we have a stoppage of one or more of these excretory organs, what is the result. The amount of decaying material that would have been excreted by the organ or organs whose functions have been st
in the blood mass, and goes the rounds o
The effect of such retention is, that
mass that are not sufficiently vit

changes going on in the retained decaying matter, are affected by it, and thus increase the amount of morbific material. This degenerating material in the blood affects every function of the system; thus nutrition can not be perfectly performed, from the fact that the nutritive material is not normal in quality; again innervation is affected, not only from the want of a properly constituted nutritive material, but also from the lack of the proper stimulus furnished by properly elaborated blood in the commencement, and by a greatly increased stimulation when reaction takes place, for the removal of the offending substance. Again the secretions are vitiated, from the vitiated material in circulation, and thus we have defective digestion.

We may profitably devote a small space to the consideration of the laws which govern the action of an organic body in a state of decomposition, on other organized bodies, and especially on the blood. The chemical law that governs this action, according to Liebig, is the law of physics proposed by La Place and Berthollet. "*A molecule set in motion by any power can impart its own motion to another molecule with which it may be in contact.*" This law holds as true in chemistry, as in physics. We see its manifestation in every change of organized matter from a higher to a lower grade of organization; its effects are also visible both within and without the system.

Liebig compares the action of decaying material within the blood, to diastase or yeast. Yeast we may define to be a compound of nitrogen in a state of putrefaction or decay, and is capable of producing a similar action in all organized material with which it may be brought in contact. According to the same author, "yeast and putrefying animal and vegetable matters act as peroxyd of hydrogen does on oxyd of silver, when they induce bodies with which they are in contact to enter into the same state of decomposition."

"From the foregoing facts it follows, that a body in the act of decomposition (it may be named the *exciter*), added to [illegible] fluid in which its constituents are contained, can itself in that fluid, exactly in the same manner as oduced when yeast is added to liquids con- s must be more certainly effected when the liquid acted upon contains the body by which the *exciter* has been originally formed.

"It is also obvious, that if the *exciter* be able to impart its own state of transformation to one only of the component parts of the mixed liquid acted upon, its own reproduction may be the consequence of the decomposition of this one body.

"This law may be applied to organic substances forming part of the animal organism. We know that all the constituents of these substances are formed from the blood, and that the blood by its nature is one of the most complex of all existing matters.

"Nature has adapted the blood for the reproduction of every individual part of the organism; its principal character consists in its component parts being subordinate to every attraction. These are in a perpetual state of change or transformation, which is affected in the most various ways, through the influence of the different organs.

"The individual organs, such as the stomach, cause all the organic substances conveyed to them, which are capable of transformation, to assume new forms. The stomach compels the elements of these substances to unite into a compound fitted for the formation of the blood. But the blood possesses no power of causing transformations; on the contrary, its principal character consists in its readily suffering transformations; and no other matter can be compared in this respect with it.

"Now, it is a well-known fact, that when blood, cerebral substance, gall, pus, and other substances in a state of putrefaction, are laid upon fresh wounds, vomiting, debility, and at length death, are occasioned. It is also well known that bodies in anatomical rooms frequently pass into a state of decomposition which is capable of imparting itself to the living body; the smallest cut with a knife which has been used in their dissection, producing in these cases dangerous consequences."

Let us now apply the principles mentioned to the system, and trace the results; and to make our views more plain, we will take a case of fever arising from the retention of a secretion. Take a man, for instance, who has been exerting himself more than usual, the muscular exertion has caused a greatly increased disintegration of tissue, which partially disorganized material remains in the blood. The exertion has caused an excited action of the skin; it is relaxed, and the excretion from it is free. At this time our subject ceases his exertion, and sits down in a damp place, or in a draught of cold air; the effect of this is to stop the secretion from the skin, and the material that would have been excreted is retained within the circulation. Not only this, but the circulation is driven from the surface to the internal parts of the body, embarrassing the action of the internal excretory organs. Now, if there is not a vicarious secretion from the kidneys or intestines, the result will be fever, or inflammation of some structure of the body accompanied by it. What are the phenomena that follow? There is first a torpor of all the functions of the system, readily accounted for by the effect which the morbid material has upon the blood, and through this upon the nervous system, and all other portions of the body. In this condition the chemical force is in excess, but as this is antagonized by the vital principle we must, sooner or later, have a reaction; this reaction is fever, and is calculated to throw the morbid impressions off, and cause the elimination of the morbific matter.

The same effects may follow the introduction of such a material into the blood from without, and we will find that the same laws govern it in its action upon the system. The most familiar illustration of a morbid material introduced into the circulation from without, is the *small-pox virus.* The smallest portion of this introduced into the circulation, either by absorption, or through the lungs, produces a similar change in all portions of the blood mass, that is capable of this change. This chemical change appears to affect only a single constituent of the blood, but this is transformed into the real small-pox virus, capable of transmitting its peculiar degeneration to any other fluid containing its original constituents. According to Liebig, this change is similar to the action of yeast, both reproducing themselves with all their characteristic properties.

Again, says Liebig: "The action of the virus of *cow-pox* is analogous to that of low yeast; it communicates its own state of decomposition to a matter in the blood, and from a second matter is itself regenerated, but by a totally different mode of decomposition; the product possesses the mild form, and all the properties of the lymph of cow-pox."

We have another familiar example of the effects of a decaying substance introduced into the blood, in the effects which sometimes follow a wound made while dissecting In this case the material absorbed, if it is already undergoing decay, produces the same change in the blood, and we have dangerous disease, or in some cases death resulting.

Let us now examine the so-called *miasmatic* diseases, and see if we can not find that their production is owing to the same laws that we have been considering. These diseases have been divided into two classes by authors—those arising from the decay of vegetable matter, and those arising from decaying animal matter. The class of diseases that have been supposed to arise from vegetable decomposition are very numerous, embracing the common intermittent, remittent and congestive fevers, that appear to have their habitat in low or marshy districts. These diseases can in every case be traced to an exposure to an air impregnated with the gaseous products of decomposition. That this is the cause of the disease, however, has been disputed, from the fact that the most delicate chemical tests applied to the air in such regions, have not been able to detect the miasm. This assertion needs examination. Liebig states, "that all the observations hitherto made upon gaseous, contagious matters prove that they also are substances in a state of decomposition. When vessels filled with ice are placed in air impregnated with gaseous, contagious matter, their outer surfaces become covered with water containing a certain quantity of this matter in solution. This water soon becomes turbid, and, in common language, putrefies; or, to describe the change more correctly, the state of decomposition of the dissolved contagious matter is completed in the water.

"All gases emitted from putrefying animal and vegetable substances in processes of disease, generally possess a peculiar nauseous, offensive smell; a circumstance which, in most cases, proves the presence of a body in a state of decomposition. Smell itself may, in many cases, be considered as a reaction of the nerves of smell, or as a resistance offered by the vital powers to chemical action."

The simplest test for such decaying matter, will be found in exposing organized matter to its influence; thus, the air of a swamp, when all the conditions are present that appear to produce fever, will cause rapid putrefaction of fresh meat exposed to it.

We would not, however, wish to be understood as saying that all remittent or intermittent fevers are generated from the so-called miasmata; for we have already shown that a similar effect is produced by the retention of an excretion. Neither do we believe that when all the conditions are present for its generation, that all who expose themselves to it will be affected; for if the vital force is sufficiently strong to resist the chemical changes, no disease can be produced.

Decaying animal matter acts in a similar manner to other decomposing material; the same laws govern its effect upon the blood, though the disease produced may assume a different form. Disease produced in this way is said to arise from contagion; the examples of disease arising in this manner are very familiar. Thus we have *scarlatina*, *measles*, etc., epidemics of puerperal fever, of *erysipelas* in hospitals, etc., and the production of ship fever, where large numbers of persons are confined together.

We have considered defect or perversion of the blood only in relation to acute diseases, the effect being immediate; but instead of an acute disease, we may have a chronic disease arising from the same causes. As we do not propose, however, to write a treatise on pathology, but have occupied this space merely to give our views on some disputed questions, we will have to refer the reader to works on pathology proper. To further elucidate our views, we append the tables of primary and proximate elements of disease, taken from Williams' Principles of Pathology.

PRIMARY ELEMENTS OF DISEASE.

STRUCTURAL CONSTITUENT.		ITS FUNCTION.	STRUCTURAL DISEASE.
Contractile fiber.		Irritability. Tonicity.	Excessive. Hypertrophy Deficient. Atrophy Perverted. Degeneration.
Nervous structure.	Tubular (the conductor of nerve force). Vesicular (the generator and combiner of nerve force).	Sensation. Voluntary motion. Involuntary motion (excited motor action). Sympathetic action.	
Secreting structure.		Secretion.	
Elementary components of blood.	Red corpuscles. White corpuscles. Fibrin. Albumen. Oil, and combustive matters. Inorganic ingredients (saline and mineral). Water.		
Elementary changes in the blood.	By respiration. By secretion. By nutrition. By foreign matter.		

PROXIMATE ELEMENTS OF DISEASE.

The circulating blood.	Deficient in quantity—Anæmia.	General. Partial.			
	Excessive in quantity—Hyperæmia.	General—Plethora.	With Circulation	Increased—Sthenic. Diminished—Asthenic	
		Partial—Local hyperæmia.	With Circulation	Increased—Determination of blood. Diminished—Congestion	
				Partly inc. Partly dim.	Inflammation.
	Perverted in quality—Cachæmia.				
Nutrition of Textures.	Deficient—Atrophy.				
	Excessive—Hypertrophy.				
	Perverted—	Degenerations of tissues. Morbid deposits. Morbid growths.			

ON THE MODE BY WHICH THE NATURAL POWERS OF THE SYSTEM REMOVE DISEASE.

"There is," says Dr. Williams (Principles of Medicine, p. 88), "in organized beings a certain conservative power which opposes the operation of noxious agents, and labors to expel them when they are introduced. The existence of this power has long been recognized, and in former days it was impersonated. It was the *archæus* of Van Helmont; the *anima* of Stahl; the *vis medicatrix naturæ* of Cullen. But without supposing it to be aught distinct from the ordinary attributes of living matter, we see its frequent operation in the common performance of excretion; in the careful manner in which the noxious products of the body, and offending substances in food, are ejected from the system; in the flow of tears to wash a grain of dust from the eye; in the act of sneezing and coughing to discharge irritating matters from the air-passages, and in the slower, more complicated, but not less obvious example of inflammation, effusion of lymph and suppuration, by which a thorn or other extraneous object is removed from the flesh.

"This *vis conservatrix* is alive to the exciting causes of disease, and in persons in full health it is generally competent to resist them. How it resists them will depend upon what they are. For instance, is cold the cause?—This throws the blood inwardly, which, by increasing the internal secretions and exciting the heart to increased action, establishes a calorific process which removes the cold. Is the cause improper food?—The preserving power operates by discharging this speedily, by vomiting or by stool. Is it a malarious or contagious poison?—It is carried off by an increase of some of the secretions. But if this resisting power be weakened, locally or generally, or if the exciting cause be too strong for it, then the cause acts, and disease begins."

It has already been stated that in many cases the natural powers of the system are sufficient for the restoration of health, and also that the physician who proposes to benefit the sick should carefully assist these efforts of nature. The question now comes up, how does nature remove disease?

In general disease we find that this is accomplished by a concentration of the vital force, and an increased secretion from those organs that normally eliminate noxious materials circulating in the blood. Of these organs, the kidneys, skin and glandulæ of the intestinal canal, are the principal. In all of this class of diseases, we find that one or more of these organs are inactive during its progress; but their activity and the quantity of the excretion is greatly increased in the decline of the disease. The opinion is very prevalent among physicians, and is taught by many teachers and the majority of text-books, that this increased excretion is not a necessary process in the removal of disease—that it is merely the result and not the cause of the cure. We will also find that these same authorities never allude to the fact that the system will, in a majority of cases, relieve itself of disease.

Any one that carefully examines the properties and therapeutic effects of all the most prominent articles of the materia medica, can not fail to be convinced that a very large majority of them owe their beneficial effects either to a direct or indirect action in increasing excretion and the elimination of morbid materials from the system. Thus the classes of *diaphoretics*, *diuretics* and *cathartics* act directly in this way, and are administered for this purpose. The entire class of *alteratives*, also, undoubtedly owe their beneficial effects in the most part, to their eliminating action. Emetics not only act directly as eliminatives, by causing the evacuation of morbid secretions from the stomach, but also indirectly by their sedative and relaxing effects upon the system when under a high state of excitement, this relaxation being almost invariably followed by an increased secretion from the proper eliminating organs. So with the prominent class of sedatives, though not directly affecting the secretory apparatus, yet by their controling influence over the circulation, high vascular excitement is subdued, and secretion is the natural result.

If we trace the course of any general disease where no treatment has been pursued, we will find that increased secretion and consequent elimination always precedes a change for the better; and the same is true where even the most opposite remedies have been used. Without this increased elimination does take place, death is inevitable. This accounts for the great success of Reformed Physicians in treating the common acute diseases of this country. Their attention has been especially drawn to the importance of due attention to these emunctories, and a large portion of the treatment is directly to stimulate elimination in this way. This will be apparent by a mere glance at the agents most used. In addition to this, the fact generally recognized by them, that in disease there is always a depression of the vital force of the system, and that this should be kept up by *tonics* and *stimulants*, has also added materially to their success.

That nature is able to cure almost all curable diseases, is clearly proved by the results of homeopathic treatment. There are very few medical men who have any faith in the efficacy of their attenuations and dilutions, and yet we find that more favorable results are obtained under this treatment, than under the old depletive system. This well-known fact is sufficient evidence that patients will get well without medicine, and that medicine said to be scientifically administered, is responsible for no small percentage of deaths under regular treatment.

We would not be understood to argue that the physician must confine himself to the administration of such agents as increase elimination, or favor natural processes. This is always an important point to be kept in view; but we have also the power of regulating vital action in the system, at least to some degree. Thus we can moderate excessive vital action or excitement; we can increase it when too feeble, and sustain in all cases the vital powers of the system. We can also modify the condition of the circulating fluids, prevent rapid disintegration of the tissues, promote nutrition, relieve pain, etc., all very important indications.

These few remarks we have thrown out as a check or guide to the reader, in the consideration of the following parts of the work, as it might be supposed that we, like many others, were of the opinion that the cure of disease depended entirely upon the remedies administered.

Action of Medicines upon the System.

We might arrange all remedial agents in three classes, according to the effect they exert upon the system, whether it is *physical*, *chemical* or *vital*. All agents act in one of these three ways, though it is impossible sometimes to distinguish between them, as an agent may first affect the body by its physical properties, and secondly by both a chemical and vital change in some of its constituents.

Physical Effects of Remedies.—The action of remedies may be owing to their form; in this case we say the action is physical; but this is the case with but very few agents, and these are the anthelmintics: thus the hairs of the pods of *mucuna pruriens*, or the *stanni pulvis* of the pharmacopeiæ, are said to act in this manner. These agents are supposed to act mechanically in destroying worms. All other agents that have been said to act in this manner, would produce no effect at all if they did not act in a living body; hence we may name such agents *physico-vital.*

Chemical Effects of Remedies.—According to Pereira, in consequence of the mutual affinities which exist between some medicines and the constituents of the tissues and of the blood, numerous and important chemical effects are produced in the animal economy. The *halogenous bodies*, some of the *combustible metalloids*, the *acids*, the *alkalis*, *metallic salts*, *tannin*, *creosote* and *alcohol* act in this way.

1. The *halogenous bodies* (*chlorine*, *bromine* and *iodine*) abstract hydrogen and unite with bases. Indirectly they become oxydizers by taking hydrogen from water and setting free the oxygen. In some cases they may, perhaps, combine directly with organic substances.

2. The *non-metallic combustibles* (sulphur and phosphorus) combine with both oxygen and hydrogen.

3. The *acids* (sulphuric, nitric, hydrochloric, phosphoric and acetic) combine with bases, decompose many salts, and unite with or decompose the organic constituents of the body.

4. The *alkalis* unite with acids, decompose some salts, and combine with or decompose the organic constituents of the body.

5. Most *metallic salts* react chemically on the organic tissues, and give rise to the formation of new compounds.

6. *Tannic and gallic acids.*—Tannic acid, in the impure state called tannin, acts on the animal tissues in virtue of its affinity for their constituents. It forms with albumen and gelatine compounds which are insoluble in water; and it also combines with fibrine. When taken into the stomach, it unites with the constituents of the epithelium, and of the mucous membrane of the alimentary canal. It becomes absorbed, and is evacuated from the system in the urine.

7. *Creosote, Alcohol and Ether.*—Both creosote and alcohol cause the coagulation of albumen.

In addition to the classes of agents named, there are but very few but what exert some chemical influence on the system. As a general rule, however, the beneficial effect of a remedy is not entirely dependent upon its chemical effect, but upon some change in the vital force of the system, so that we might justly call the action of this class of agents *chemico-vital.*

Vital Effects of Medicines.—The influence of all remedies upon the system must for the most part be vital in its nature, though it may depend in some part of its action on its physical condition, or on its chemical properties; its major action is such only as could be exerted in a living body. The class of vegetable remedies exert the least physical or chemical effect upon the system; they appear to act directly upon the vital force of the entire system, or on some particular organ or parts.

These remedies either stimulate or depress the functions of the different secreting and excreting organs, increase or diminish digestion and sanguification, stimulate or depress the nervous system, etc. They might be divided into three classes according to their effects upon the system, though such a division would but generalize the subject. The first of these classes would include all those agents which highten or augment vital action, and would hence be called *stimulants;* the second those that depress nervous action, or *sedatives;* and the third those that alter either the nature or quality of vital action, being neither stimulant nor sedative; this class might be called *alteratives.*

PARTS TO WHICH MEDICINES ARE APPLIED.

Medicinal substances are principally applied to the skin and mucous membrane; to serous membranes, to wounds, ulcers, etc., though in some few instances they have been introduced into the circulation by injecting the medicinal substance into the veins.

Application to the Skin.—Applications are made to the skin with a view to their local effect, as well as with a view to their remote influence upon distant parts.

Liniments, lotions, embrocations, fomentations, cataplasms, blisters, setons, issues, etc., are employed to relieve local painful affections, and to establish a new action and exert a derivative influence in deep-seated disorders attended with irritation, congestion or local inflammation.

The methods of application are three, viz: the *enepidermic*, *iatraleptic* and *endermic*.

The *enepidermic* method is that by which the medicinal agent is applied to the skin unassisted by frictions, as when we apply sinapisms, blisters, poultices, fomentations, baths etc.

In many instances the medicated vapor-baths, consisting of a solution of the volatile principles of either vegetable or mineral agents, afford much relief in cutaneous diseases, as well as in the diseased states of internal organs, mucous surfaces, etc.

Sinapisms, *blisters* and other *counter-irritants* are used principally for their revulsive effect; they give rise to a new point of excitation, and detract the circulation and nervous influence from internal organs to the surface. Though we can not analyze the *modus operandi* of this action, yet the fact (the main thing), is very apparent.

Poultices, *fomentations*, *etc.*, are used to relax the parts to which they are applied, to apply heat or cold to a part, and to shield parts from the action of the air.

The *iatraleptic* method consists in the application of medicated substances to the surface, aided by frictions. It is also termed the *epidermic* method. Many substances are employed in this way, as liniments, ointments, etc.; also particular agents, as many of the narcotics, camphor, sulphate of quinia, aconite, belladonna, morphia, etc.

The *endermic application*, sometimes termed the *emplastro endermic* method, consists in applying medicated substances to the denuded dermis; the epidermis being removed by a blister. Substances in the form of an impalpable powder may be applied, or if too irritating, they may be incorporated with lard, cerate, or some unctuous substance. In this way morphia, or its salts, strychnia, camphor, musk, sulphate of quinia, extract of belladonna, aconitina and various other substances may be introduced into the system.

To remove the epidermis, the common blistering plaster, or equal parts of strong aqua ammonia and lard, may be applied. Medicines, when introduced into the system in this way, are not subject to the action of the digestive organs, and hence their effects can be better determined. Their action is in some cases more rapid than when introduced into the stomach. This mode of employing remedies is especially appropriate in cases where the patient can not or will not swallow, and in cases of extreme irritability of the stomach, or in inflammation of the gastric mucous membrane.

In some instances of local painful affections, as in neuralgia, or rheumatism, medicines have been applied with signal benefit by *innoculation*—morphia, or some other agent being introduced into the painful part by the point of the lancet.

Applications to the Mucous Membranes.—Agents are often applied to the different mucous membranes, as the *pituitary*, *trachea-bronchial*, *gastro-intestinal*, *recto-colic*, *urino-genital* and *utero-vaginal* membranes.

Medicines are applied to the *nasal* or *pituitary* mucous membrane to irritate it and excite an increased secretion in disease of that surface, and parts adjacent, when they are called *errhines;* but if they occasion sneezing (which is desirable in cases in which foreign bodies are lodged in the nasal cavities), they are termed *sternutatories.*

Medicinal agents, when properly applied to the *trachea-bronchial* mucous membranes, are capable of exerting the most salutary influences. They are mostly employed for local purposes, as in phthisis, chronic bronchitis, asthma, etc. Numerous are the substances which have been applied to this membrane—nitrate of silver, sulphate of iron, cinchona, myrrh, pinus canadensis, etc., when reduced to an impalpable powder have been inhaled in certain states of the pulmonary organs with advantage. The fumes of tar, resins, balsams, and various etherial solutions have been strongly recommended as inhalations in certain diseases.

Pereira recommends the tar used in the cordage of ships, one ounce of the carbonate of potassa being added to every pound of the tar to neutralize the pyroligneous acid, and prevent coughing. The tar is to be placed over a lamp, and kept boiling in the chamber of the patient both night and day. The vessel containing the tar should be cleaned and replenished every day, to prevent the residuum from being burned and decomposed, and thus increase the cough and oppression in the chest.

Simple aqueous vapor, and other medicated vapors are often highly useful in disease of the lungs and throat. The vapor may be inhaled through a teapot, or basin covered with an inverted funnel, or by inserting a tube through the stopper of a wide-mouthed jar containing the warm medicated fluid. Narcotic and emollient agents are employed in this way; also, hot vinegar, sulphuric ether, camphor, tincture of iodine, tincture of conium, chlorine gas as it issues from moistened chloride of lime, etc.

Medicinal agents are mostly applied to the *gastro-intestinal* mucous membrane, which is termed the method by *ingestion.* From the great susceptibility of this membrane to impressions made by medicinal agents, and from the facility with which they are absorbed, and the nervous sympathy existing between this membrane and other parts of the body, it presents the most useful surface for the sanative application of medicinal agents. Their remote effects are more readily and more certainly secured than when applied to any other part of the system.

The *recto-colic* mucous membrane is readily affected by agents which are absorbed, as opium, tobacco, etc.; but twice or three times the ordinary dose is required to produce the desired effects.

Medicines are applied to the rectum to relieve disease in that or adjacent organs, as the bladder, uterus, or prostate gland; sometimes to secure alvine evacuations, by dissolving hardened feces, or exciting the peristaltic action of the bowels; sometimes with a view to their derivative action in diseases of the brain, and occasionally to remove the ascaris vermicularis, or small thread-worm.

If the substances applied to the rectum are solid, they are termed *suppositories;* if fluid, *enemata, lavements,* or *clysters.*

To the *urino-genital* mucous membrane, caustic or medicated bougies are applied; or anodyne, demulcent, astringent, or refrigerant injections are employed; and, in some cases, medicated fluids are injected into the bladder.

Remedies are applied to the *utero-vaginal* mucous membrane, to remove local disease, as in inflammation, morbid growths, etc.; they are also used to check excessive secretions, sanguineous discharges, and to promote the catamenial discharge.

ON THE MODE IN WHICH MEDICINAL AGENTS ACT WHEN INTRODUCED INTO THE STOMACH.

A legitimate, and by no means unimportant or uninteresting question, is, as to the mode by which medicinal substances act when introduced into the stomach, so as to remove abnormal states of the general system, or of particular organs. We will first look at their apparent effects, before examining the mode by which their action is effected.

Remedies may operate directly upon the organs diseased, and newly impress them,—change the morbid action present by substituting a new and different one that shall supersede or displace the primary affection; and by this means a cure is sometimes effected. Thus in dysentery, diarrhea, cholera morbus, nausea and vomiting, and many other disorders affecting specifically particular tissues, by exhibiting agents that exercise a specific influence upon the parts diseased, a new impression is produced corresponding with the morbid one already existing, though differing from it in kind and intensity of action, and by this means the original one is effectually removed. Indeed the substitution of a new action or impression in a diseased organ, often most effectually removes the primary one, and as soon as the part recovers from the temporary medicinal action, a normal state ensues. Although results of this kind do not always follow, yet the exceptions to this rule constitute no valid objection to the truth of the general proposition.

In this way cathartics prove beneficial in dysentery and diarrhea, emetics in cases of nausea and vomiting, and cantharides, turpentine, and other stimulating diuretics, in chronic irritation, or inflammation of the urinary organs. That other impressions and modes of action may follow the exhibition of these remedies, by which aid may be derived in subduing the morbid states, can not be doubted. Thus, they may excite the surfaces with which they come in contact to an increased secretion, and thus deplete the distended vessels, while the increased secretion may remove a noxious material from the blood, which has assisted to keep up the disease; the increased secretion may likewise shield, and thus lessen the irritability of the inflamed or irritated surfaces. The impression which they make upon other organs, or upon the general system, may also enable us to account in part for their sanative influences upon those tissues.

In the second place remedial agents may exercise a sympathetic influence upon the whole system. Some medicines act primarily upon the solids, and these impressions are transmitted through the agency of the nervous system to every part of the body. The remote effects of medicines are far from being confined to the parts with which they are brought into direct contact; on the contrary, parts distant from these are strongly influenced or impressed by remedial agents. Emetics, for instance, act primarily and specifically upon the stomach, but their most important sanative influence is transferred through nervous sympathy to other organs, and thus every tissue of the body is influenced or newly impressed by them; old associations and perverted sympathies are broken up, and a new action established, the tendency of which is, by this change of action and sensation, to restore the system to health.

The same remarks apply to cathartics. They act specifically upon the alimentary canal, causing alvine evacuations, and thus remove the vitiated and disease-creating accumulations of the intestinal canal—a prolific source of disease. But this is far from being the only way in which these contribute to the restoration of health. They excite the intestinal exhalents, and thus act as depletives, thereby promoting increased absorption and nutrition; they also exercise a strongly revulsive influence, by which a new surface or point of excitation is established, and by this counter-irritant effect, remote organs are relieved of congestion, inflammation and other morbid states. The whole system is impressed by their action, and important changes wrought upon the animal economy. Tonics and stimulants may act directly upon the sentient extremities of the nerves of the stomach, and thus arouse or excite that organ to increased energy, and thereby promote digestion; and thus favor the process of chymification and chylification, and by this means indirectly promote nutrition and the renovation of an exhausted or enfeebled system. By the agency of the same classes of medicines, a transmitted influence is extended through the nerves to every part of the body, and in this manner every fiber is newly impressed, and a modified state of the vital manifestations in every part of the body is the result.

In the same manner we may explain the therapeutic agency of other classes of agents in the removal of disease. In this way we may explain the highly sanative effects of ablutions—we apply them to the surface and the impression there made is transmitted to every portion of the system, and a general reaction results from a timely and appropriate resort to these means. The advantages attending their employment, often so conspicuous, can be explained only upon the ground that the new impression made upon the surface is transmitted by nervous sympathy to other parts of the body.

That the animal economy possesses the faculty of transmitting impressions, whether morbid or sanative, from one part to another is indisputable. This power is essential to the preservation of living beings, and the vital actions would soon cease, did not a connected medium exist, by which each part is brought into a reciprocal relation and mutual dependence upon others. The brain and nervous system constitute the medium through which these sympathetic phenomena are transmitted, and remedial as well as morbid impressions are propagated through this source to all parts of the animal economy.

Thus every therapeutic agent or appliance may be said to alter or modify the sensations, actions, functions or condition of some organ through this medium; their primary action may be upon particular parts, and remote from those over which they exercise an important curative influence, and this secondary influence may not be in every case immediately appreciable. How wonderful then is the bond of union which exists between the various organs of our bodies; that it does exist, does not admit of a doubt; that a reciprocal intercourse of relations, sensations, and sympathies is maintained between all parts of the animal economy is apparent. These links unite all parts of the system, and thereby establish that concurrence of action, and that perfect harmony of function, which when beheld, can not fail to strike the observer with wonder and admiration. In this way then are we enabled to explain many of the sanative influences wrought upon diseased organs or states of the system, by the administration of medicinal agents.

Again, remedies may act directly upon the blood, either adding something to it, or modifying its constituents. We have a large class of agents termed *restoratives* that act in this manner; they are of great importance in the treatment of any disease in which the blood mass has lost its normal character. In health, food is the proper restorative, it supplies the blood with all its constituents, with all substances required to supply growth, to repair waste, and to maintain the various functions at the healthy standard. Disease may result from improper food, or want of assimilation in that which is taken, and thus we have as the proximate cause a defect of some of the constituents of the blood. We have a familiar example of this in Chlorosis or Anæmia; in both these diseases there is a defect in the quantity of the red globules of the blood. The treatment in this case should be directed to the restoration of the defective material; this is done by the administration of iron, which assists to form the deficient element. Again we suppose that the class of tonics add to the blood some vital constituent that is lacking; no one can have failed to notice the beneficial effects of this class of remedies upon the system: all of them are readily absorbed, and chemists inform us that they are not excreted, without they are taken in large quantities. This being the case, it is reasonable to suppose that they remain in the blood, and assist in supplying material to the various parts of the body.

Some agents exert a modifying influence on the blood, and on the system; these agents are generally termed *alteratives*. This class of agents we know less about than any other; there is no doubt that many of them owe their medicinal action to their effect as eliminatives, but their entire effect can not be ascribed to this cause, so that we must suppose a part of their action at least must depend upon their influence on the blood.

Again, some classes of agents owe their sanative influence to their eliminative action, either stimulating the excretory organs of the body to a normal performance of their function, or uniting with a morbid material in the blood, pass with it through an excretory organ, by virtue of their special affinity for it. To this class of agents belong cathartics, emetics, diaphoretics, diuretics, etc. They are used to remove morbid material from the circulating fluids. "To restore the natural secretion of a part when its diminution or stoppage results from torpor or deficient vascular activity of the secreting organ. To augment the natural secretion of a part, and thereby diminish the quantity of circulating fluid. To augment the natural secretion of a part, and thereby to promote absorption—as in dropsy. To augment the secretion of one part, and thereby to lessen the secretion of some other part. To augment the secretion of an organ, and thereby relieve local determinations of blood to remote parts; as when we administer purgatives to relieve determination of blood to the brain. To promote secretion, and thereby to favor the subsidence of diseases whose natural termination is by increased secretion. To produce exhaustion (the secondary effect of evacuants), and thereby to act as antiphlogistics."

In the further consideration of this subject, we will adopt the propositions of Headland, with some modifications, as the basis of our remarks. Perhaps no other writer has done more to unravel the intricate questions in regard to the action of remedies than this author, and we will quote freely from his work where his views appear to be founded upon fact or correct reasoning. He bases his views of the action of remedies introduced into the stomach, upon ten propositions These propositions relate to the general conduct of medicines after their introduction into the stomach, and before their absorption into the blood, and of their subsequent effects after they have passed into the blood. They are as follows:

Prop. I. That the great majority of medicines must obtain entry into the blood, or internal fluids of the body, before their action can be manifested.

Prop. II. That the great majority of medicines are capable of solution in the gastric or intestinal secretions, and pass without material change, by a process of absorption, through the coats of the stomach and intestines, to enter the capillaries of the portal system of veins.

Prop. III. That those medicines which are completely insoluble in water and in the gastric and intestinal juices, can not gain entrance into the circulation.

Prop. IV. That some few remedial agents act locally on the mucous surfaces, either before absorption, or without being absorbed at all. That they are chiefly as follows:

a. Irritant emetics.

b. Stomach anæsthetics.

c. Irritant cathartics.

Prop. V. That the medicine, when in the blood, must permeate the mass of the circulation, so far as may be required to reach the parts on which it tends to act. That there are two possible exceptions to this rule:

a. The production of sensation or pain at a distant point.

b. The production of muscular contraction at a distant point.

Prop. VI. That while in the blood the medicine may undergo changes, which in some cases may, in others may not affect its influence. That these changes may be:

a. Of combination.

b. Of re-construction.

c. Of decomposition.

Prop. VII. That a first class of medicines, called hematics, act while in the blood, which they influence. That their action is permanent.

1. That of these, some, called *restoratives*, act by supplying, or causing to be supplied, a material wanting, and may remain in the blood.

2. That others, called *catalytics*, act so as to counteract a morbid material or process, and must pass out of the body.

Prop. VIII. That a second class of medicines, called *neurotics*, act by passing from the blood to the nerves, or nerve-centers, which they influence. That they are transitory in action.

1. That of these, some, called *stimulants*, act so as to exalt nervous force, in general or in particular.

2. That others, called *narcotics*, act so as first to exalt nervous force, and then to depress it, and have also a special influence on the intellectual part of the brain.

3. That others, again, called *sedatives*, act so as to depress nervous force, in general or in particular.

PROP. IX. That a third class of medicines, called *astringents*, act by passing from the blood to muscular fiber, which they excite to contraction.

PROP. X. That a fourth class of medicines, called *eliminatives*, act by passing out of the blood through the glands, which they excite to the performance of their functions.

The first proposition affirms that the great majority of medicines must enter the blood before they can exert their peculiar influences upon the system. That this is true is readily proven by the fact that medicinal agents introduced into the stomach disappear, and no trace of them can be found in the alvine evacuations, unless they are agents which act specifically upon the alimentary canal. It is proven by the action of remedial agents upon the child at the breast, showing that the remedy has been absorbed, and that the milk of the mother has been medicated, it being rendered purgative by senna and narcotic by opium. Rhubarb in the secretions, madder in the bones, silver in the skin, and mercury in various parts of the body, when these agents have been administered, are additional examples going to prove the same proposition. Again, the odor of musk, garlic, onions, and various other agents, is readily detected in the cutaneous excretions, and in the breath. The coloring matter of indigo, iodine and madder is recognized in the milk, and the same principles, as well as the chemical constituents of agents almost without number are readily detected in the urine.

It is said that the *amanita muscaria*, a species of fungus, produces inebriation, and that the inhabitants of Northern Asia use it for this property. He who has eaten it will, in the course of twenty-four hours, have slept himself sober; when if he takes a teacupful of his urine, he will again become intoxicated; and a party of drunkards, it is said, may keep up their debauch for an indefinite period of time by drinking the urine of each other—one only having eaten the fungus.

That medicines act after having gained entrance to the blood, and that this is requisite to their action, is proven by the fact that remedies act in the same way when introduced into any other part of the system, or by being injected into the veins, as they do when introduced into the stomach. Thus iodine injected into the scrotum, for the cure of hydrocele, has been detected in the urine. Croton oil, or a liquid preparation of gamboge, jalap, or rhubarb, rubbed in sufficient quantity upon the abdomen, produces purging. A moistened leaf of tobacco applied over the radial artery, has been known to produce vomiting. A solution of aconitina applied to the skin, will produce numbness and tingling of distant parts. When medicinal substances are injected into the veins, they produce the same effect as when introduced into the stomach: thus, emetic substances produce vomiting; castor-oil, purging; opium, or its active principles, narcosis; strychnine, convulsions, etc.

It is proved that remedies must act through the blood, and not through the medium of the nerves, by the direct experiment that a poison will not act when introduced into the body, if the circulation from the part is cut off. Or the reverse experiment of Magendie proves this position. He introduced into the crural artery of a dog, the barrel of a small quill, upon which he fixed the vessel by two ligatures; the artery was divided in a circular direction between the two; he then did the same with the crural vein; thus all communication between the thigh and the rest of the body was interrupted, except the arterial blood, which passed to the thigh, and the venous blood, which returned from it. The poison introduced into the part produced its effect in the ordinary time—about four minutes. In this instance there could be no doubt but that the poison was absorbed by the veins, and through them carried into the circulation, from which it acted.

The objection that some agents act so rapidly that there is not sufficient time for their absorption and conveyance in the the circulating fluids to the part on which they act, is also removed by direct experiment. Mr. Blake made an experiment on a dog in order to test the rapidity of absorption: he placed half a drachm of hydrocyanic acid on the tongue of the animal, having first fitted a tube into the larynx, so as to prevent the vapor from passing into the lungs; he found that fifteen seconds elapsed before any morbid symptoms appeared, and death did not occur until forty-five seconds after the exhibition of the poison. Mr. Blake also found that a chemical agent would traverse the entire circulation of a dog in nine seconds, and of a horse in twenty seconds; so that sufficient time elapses for the absorption and conveyance through the system of even those agents that act with the greatest rapidity.

The second proposition states that the great majority of medicines are capable of solution in the gastric or intestinal secretions, and pass without material change, by absorption, into the capillary veins of the stomach and intestines. That they do this is proved by the facts already stated, but the question is, how is it accomplished? The physical agency by which absorption is accomplished (*imbibition* of Magendie, or *endosmosis* of Dutrochet), consists in the tendency of *rarer* fluids to permeate membranes into cavities containing those of greater density. The circumstances which determine the passage of fluid through the coats of a vessel are principally five: 1. *The densities of the liquids.*—Other things being equal, the lighter of the two tends to pass through to the heavier, more than the heavier to the lighter. 2. *Their attraction for the intervening membranes.*—That one passes through most, which has the greatest affinity for the membrane. 3. *The affinity of the fluids for each other.*—A fluid passes through more rapidly when it is readily taken up and dissolved by that on the opposite side. 4. *The motion of the fluid on one side* promotes the passage through of that on the other, because it is carried off as fast as it permeates the membrane. 5. The last law is that *any pressure on the fluid on one side of the membrane* has a powerful influence in determining the passage of the current from that side.

Magendie demonstrated the fact that when there was vascular repletion, absorption was very slow; but by depleting the vessels, absorption became very active. In one instance he injected about a pint of water into the veins of a dog; and placing in the pleura a moderate dose of a substance with the action of which he was familiar, he found that its effects were not apparent until many minutes after the ordinary time. In another experiment he depleted the vessels by abstracting a half-pound of blood, and the effects which ordinarily did not occur until the end of two minutes, developed themselves in thirty seconds.

Remedies, however, can not be absorbed without they are first dissolved and held in solution. A large number of agents are soluble in water, and these are readily absorbed. Some are rendered soluble by the addition of an acid to the water, and as the gastric juice contains an acid we have here the materials for their solution. Again others require a fluid with an alkaline reaction; and passing down into the duodenum they come in contact with the bile, an alkaline fluid, and are thus rendered soluble. Albumen and like matters are rendered soluble by the action of the gastric juice. Thus a great majority of remedies are rendered soluble, and are then absorbed; but we have agents that are insoluble in any of these fluids, and these either pass through the alimentary canal without exerting any medicinal influence, or they act as irritants or sedatives to it.

The third proposition affirms that those substances that are insoluble can not be absorbed into the circulation. This is a generally admitted fact and needs no proof, as its affirmation would conflict with well-known physical laws.

The *fourth* proposition affirms that some remedies act locally on the parts with which they come in contact. Some of these agents act first upon the stomach and intestines and are then absorbed; others are entirely insoluble and after their action pass from the body with the feces. These agents may be classed as follows: 1. *Antacids*, 2. *Chemical Antidotes*, 3. *Astringents*, 4. *Anæsthetics*, 5. *Irritant Emetics*, 6. *Irritant Cathartics*, 7. *Agents which affect the process of Endosmose.*

1. *Antacids* are employed to neutralize acidity of the stomach; they combine with and neutralize free acids contained in this viscus; they are then absorbed. Pereira states that they

probably aid in the digestion and absorption of fatty substances, especially when there is a deficiency of bile and pancreatic juice.

2. *Chemical Antidotes* are used to counteract poisons by rendering them insoluble, or converting them into harmless substances.

3. *Astringents* exert their effect locally as styptics, checking hemorrhage from the stomach.

4. *Anæsthetics* are employed to relieve gastrodynia and other painful diseases of the stomach. They include hydrocyanic acid, creosote and tris-nitrate of bismuth, and probably some others. They act in the same manner as aconite or morphia in painful diseases of the skin, by paralyzing the sentient nerves of the stomach — this action depending on local contact. The first two are afterward absorbed; but the third is insoluble, and acts also as an astringent to the mucous surface.

5. *Irritant Emetics* act by producing local irritation of the mucous membrane of the stomach. The impression is transmitted to the spinal cord, and by a reflex action the muscles concerned in the act of vomiting are excited to action, to expel the offending substances. Such agents produce but little nausea, and unlike *specific* emetics, which act upon the stomach into whatever part of the system they are introduced, these act only when brought into direct contact with the mucous membrane of the stomach.

6. *Irritant Cathartics* act in a similar manner as the same class of emetics; that is by their irritant effects on the mucous membrane of the intestinal canal, they cause an increased secretion from that canal, and stimulate the peristaltic action. Their action differs widely from that of *specific* cathartics; for these latter, as castor-oil, aloes, rhubarb, colocynth, elaterium and others will act as cathartics if absorbed through the skin, or injected into the veins. Many agents act in both ways, that is, they are partially absorbed and exert their influence through the blood; but being slowly soluble in the fluids of the body they exert a direct, irritant effect upon the walls of the intestine. We have examples of this in the class of *resinous* cathartics — as scammony, gamboge, euphorbium, podophyllin, etc. These agents

are sometimes of great value in disease of distant parts of the system, by their *revulsive* or *counter-irritant* effect.

7. Some agents *effect the process of Endosmose*—they may increase the absorption of other agents, or they may cause an endosmose of the blood serum into the stomach and intestine, or they may entirely check the process of endosmosis. Pereira makes the following classification:

"1. *Substances which undergo Endosmose and Exosmose with the Serum of the Blood.*—The kind of endosmotic influence which these bodies exercise varies, in many cases, with the degree of concentration of the solution. Very concentrated solutions in general cause endosmose of the serum; whereas dilute solutions have a reverse effect, and give rise to endosmose of the solution; and for solutions of an intermediate strength, the two currents are equal.

"*a. Substances which cause Endosmose of the Serum.*—This division includes concentrated solutions of various salts (phosphate of soda, nitrate of potash, chloride of sodium, iodide of potassium, tartrate of potash, sulphates of soda and potash, phosphate of potash and alum), native Seidlitz water, Pultna-water, sufficiently concentrated solutions of certain vegetable purgatives (manna and the extracts of senna, rhubarb, the herb mercury, tamarinds, cassia, colocynth and aloes, resins of scammony and jalap, and castor-oil), of various narcotic substances (one part of the alcoholic extract of the following substances to five parts of water: black hellebore, hemlock, henbane, aconite and belladonna), solution of cane sugar (this causes a very powerful current), dilute spirit, and a solution of cantharidin in olive-oil.

"*b. Substances which cause Endosmosis of the Solution.*—This division includes water (which produces the strongest current), dilute solutions of salts (phosphate of soda, nitrate of potash, chloride of sodium, and iodide of potassium), solutions of certain acids (acetic, tartaric, citric and sulphuric acids), of ammonia, of nitrate of strychnia, and of sulphate of quinia, hydrocyanic acid, laurel water, and certain non-purgative mineral waters.

"2. *Substances which do not undergo Endosmose and Exosmose with the Serum of the Blood.*—These may be arranged in two divisions:

"*a. Substances which penetrate the Membrane and render it unfit for Endosmose.*—To this division belong the solution of sulphureted hydrogen and decoction of tobacco. Under the influence of either of these liquids, the membrane becomes permeable, and yields to that liquid which exercises the greatest amount of pressure.

"*b. Substances whose presence puts a stop to the Phenomena of Endosmose, and renders the Membrane impermeable to either Liquid.*—To this division belongs the solution of hydrochlorate of morphia."

According to the generally received opinion of the laws of endosmosis, the purgative salts are purgative only because they are of greater density than the blood, and therefore cause an endosmose of the serum of the blood to the intestine, the increased distension exciting the peristaltic action of the bowels; hence these agents are generally hydragogue cathartics. This action is according to the law of endosmosis, that a fluid of great density, when separated by a membrane from one of less specific gravity, will cause an endosmosis of the lighter fluid.

This theory of the action of saline purgatives is adopted by Poiseble, Liebig, Matteuci, Dr. Pereira, and Dr. Golding Bird. They also contend that when these salts are much diluted they become diuretics and are excreted by the kidneys. On this point Dr. Bird states "that when saline substances, especially, are intended to reach the kidneys, it is necessary that the density of their solutions should be much below 1.028; the proportion of solids dissolved in the aqueous vehicles prescribed being always less than five per cent. Daily experience in the employment of remedies will show the importance of this law in a therapeutic sense. Thus a tolerably strong solution of the tartrate, or the acetate of potass, will altogether escape the action of the absorbents; indeed, so far from being imbibed by the capillaries, it will actually excite an exudation of water from these vessels into the stomach and small intestines, thus becoming diluted by exosmosis, a sensation of thirst is excited, by which the patient is compelled to drink for the purpose of supplying the water removed from the blood by exudation. In strong solutions, the salts alluded to stimulate the bowels and purge. They are moreover said to act as *hydragogue* purgatives, producing watery motions, a fact capable of ready explanation on physical laws; exudation of water from the exhalents (capillaries) occurring on account of the density of the saline solutions traversing the intestines. We can hence readily perceive why half an ounce of acetate or tartrate of potass will purge, and a scruple of either excite diuresis."

The *fifth* proposition states that medicines after they gain access to the blood, must permeate the mass of the circulation so far as to gain access to the parts on which they tend to act. This is proven by the fact that the agents may be detected in the different parts of the body, and in the secretions and excretions. We suppose that remedies have a special affinity for the parts on which they tend to act. As to the reason why particular agents act upon particular organs instead of others it is idle for us to speculate. Why do certain agents seek out and act upon the kidneys instead of other organs; and why do cathartics exert a specific influence upon the intestines, even though introduced into the blood vessels, or into some of the cavities of the body, or absorbed through the skin, and not taken into the alimentary canal? The reason we can no more explain than we can the reason why the planets are kept revolving in their orbits. If we are told that the movements of the planets are the result of attraction, so we may say that the determination of medicines to certain organs is occasioned by similar attractions. This, however, explains nothing, and we must after all, be content with the broad fact that such phenomena do occur, and that they are governed by certain laws; but the *cause why* they occur must forever remain concealed. As readily could we explain the reason why one plant possessing the most deadly poisonous qualities, and another that is not only innocuous, but delicious, and highly nutritious, should be produced from the same soil, both being placed in the same conditions.

The *sixth* proposition states that while in the blood, medicines may undergo changes, which sometimes affect the action of the agent, and at others do not. This proposition is too circumscribed for practical purposes, for instance we administer a dose of some agent, we wish to know first, whether it is changed before being absorbed, as we know this does take place in some instances, and whether this change affects the action of the remedy or not; then we wish to know what changes, if any, take place while the agent is in the blood. We will first consider the changes that take place in the stomach.

According to Pereira, "Some substances undergo no obvious chemical change, but being liquid or soluble, mechanically mix with the fluids of the part to which they are applied and become absorbed, as venous *aqueous liquids*, holding in solution *coloring*, odorous and other matters."

Some substances undergo more or less chemical change by the action of acids, bases, salts, albumen, casein, ptyalin, pepsin, or other substances with which they come in contact; and the newly formed body is, if soluble, absorbed but not otherwise.

The *alkaline and earthy carbonates* are decomposed by the acids of the alimentary canal, with the evolution of carbonic acid.

Most of the *metallic oxides*, and the *metallic*, *alkaline* and *earthy salts*, form new compounds with albumen, casein, etc.

Chalybeate preparations, when swallowed, are partly converted into sulphuret of iron, which darkens the feces.

The *acids*, both inorganic and organic, combine with bases; and the salts which are thereby formed unite with organic matters.

After being absorbed, medicinal agents may be changed in their *combination*; they may be *reconstructed* or *decomposed*. Our knowledge, however, of these processes in the blood is not sufficient to elucidate any facts which would have any bearing on the action of remedies; neither can we tell whether an agent has been chemically changed in the blood, or in the stomach, or the excretions. We do know, however, that very few changes take place in the blood which affect the action of the remedy.

The *seventh* proposition maintains that a certain class of medicines, called *hematics*, act while in the blood, which they influence; and that their action is permanent. These agents are supposed either to add a material to the blood which was deficient, or to remove a material from the blood which was injurious to it, or in some way change its character.

The first of these classes, called *restoratives*, embraces the most important agents of the materia medica; as already stated, they add to the normal constituents of the blood, and thus form a portion of the circulating fluid. They must then be such agents as would assist to form this fluid in a healthy state of the system, i. e., the blood must normally contain their analogues. It must not be supposed, however, that these agents are restorative in all conditions of the system, for the constituent of the blood which they increase may be in excess; hence a large number of them only prove restorative in certain forms of disease.

Headland lays down the following minor propositions in regard to their action:

"1. That they act in the blood, and that their effects are permanent.

"2. That there are naturally in the blood substances which resemble or coincide with them.

"3. That they are of use when a disease depends on the want of one or more materials in the blood."

The following classes of agents may be called restoratives in this sense: Tonics, chalybeates, acids, and alkalies.

The first class or *tonics* act first by increasing the tone of the stomach and entire alimentary canal; thus stimulating (though the effect is permanent) the process of digestion and assimilation, thus improving indirectly the quantity and quality of the blood. Do they do this merely by contact, acting locally, or are they first absorbed, then acting from the circulation? The bitter principles of agents of this class are almost invariably *alkaloids*, readily soluble in water, or in the gastric juice, and hence quickly absorbed, so that the contact of these agents with the surfaces of the alimentary canal is but of very short duration, and extends generally to only a portion of the stomach: this would tend to prove that they acted after being absorbed. By this stimulation of the digestive process we might account for the entire medicinal action of this class of remedies, as by this means they increase the quantity and quality of the blood, and the nutrition of the system; but we have reason to believe they do more than this. In miasmatic diseases, and fevers caused by the retention of an excretion, they are very efficient in counteracting the septic tendency of the morbid material. Is this action not owing to their counteracting the chemical changes going on in the body, in a similar manner to the action of hops in checking the fermentation of malt in the manufacture of beer?

In regard to the action of cinchona, which may be taken as the type of this class of agents, Sundelin observes: "The general operation consists in the *increase and exaltation of the tone of the irritable fibers of the vessels;* hence, by its use the pulse becomes fuller, stronger and regular, and the muscular power increased; also in the *general augmentation of the cohesion of the organic mass;* hence, it counteracts a tendency to liquefaction and disintegration, diminishes profuse secretions, which proceed from atony of the extremities of the vessels, and of the secerning surfaces and organs, and improves generally the crasis; and lastly, in the *augmentation of the vital energy of the sensible system.* By the last-mentioned property it restores sensibility, when defective or abnormally increased, and the property of reaction of the nervous system to their normal state, and augments the influence of this system on the muscular fiber, and on the reproductive system."

The different compounds of iron, or *chalybeate* remedies, act by directly supplying a material to the blood. They appear to be of benefit in but one condition of the system, that of *anemia;* and this disease or condition depends upon a deficiency of the red globules of the blood. The coloring matter of the red globules or *hematosin*, contains this mineral, and without a due supply of it the red globules can not be formed. Thus, by the administration of iron, the solid constituents of the blood in a case reported by M. Simon, had increased from 128.5 to 193.5 in 1,000 parts. The first effect of the iron is probably upon the red globules; it restores the deficient material, thus improving their condition, and by this means stimulates the entire system to a proper performance of its functions.

Acids prove indirectly restorative in some cases by increasing the amount of the acid in the gastric juice, as in cases of weak digestion depending upon deficient secretion of this acid. It may increase the acid of the gastric juice either directly or indirectly; it increases it directly by being added to it, indirectly by being absorbed into the blood where i would set free more of the acid than the stomach is required to furnish. If, however, there is too much acid secreted, these agents will cause indigestion; the same result will follow their inordinate use.

It is stated by Pereira that acids always combine with bases before absorption. Other authors suppose that they are absorbed as free acid; in either way, the alkaline base is derived from the blood, and hence they decrease the alkalinity of this fluid. The blood always has an alkaline reaction; hence there is rarely, if ever, a free acid in it. The beneficial effects of the vegetable and mineral acids in typhoid and other low forms of fevers, has been supposed by some authors to be owing to their neutralizing the excess of alkali, which existed in the blood in those diseases.

According to Headland, the beneficial effects of vegetable, acidulous drinks in febrile diseases, seems to be the restoration of the blood to a more natural condition, by supplying a material for oxydation. He says: "In fact, I suppose that in fevers the supply of the natural blood fuel is deficient; that the nitrogenous tissues are then oxydized to maintain the animal heat—causing not only wasting, but tending to keep up the fever by the excessive amount of oxygen demanded by this abnormal combustion; that in such a case the vegetable acid is well adapted to take the place of lactic acid, the natural fuel. For though in health the ingestion of such an acid is immediately followed by an increased acidity of the urine, when used in fevers it does not pass into the urine. It is then disposed of, or burnt, in the blood. The alkaline salt of the same acid is similarly burnt, as it would be in health; but it leaves a residue, an alkaline carbonate, which exerts upon the system the usual operation of an alkali."

Again, the mineral acids have been strongly recommended in phosphatic deposits from the urine; they are supposed to increase the acidity of the urine, and by this means the phosphatic salt is held in solution. On this subject Dr. Golding Bird says: "Unfortunately there is a great uncertainty attending their use; indeed, I feel almost inclined to question whether any of the mineral acids, except the phosphoric, really do reach the urine, and thus destroy its alkaline character; certainly in the majority of cases, even their continued employment appears to be utterly ineffectual in rendering the urine acid."

Alkaline agents prove restorative in those cases where there is a deficiency of these agents in the system, or an excess of acid; in the former case they supply the deficient material, and remain in the blood; in the latter they neutralize the excess of acid, forming salts, and are excreted from the system. They are also used to counteract the lithic acid deposit. They are supposed to be useful in rheumatism by neutralizing the acidity of the blood and the secretions.

The second class of hematic medicines, according to the proposition we are now considering, are called *catalytics* (from *Καταλυω, to loosen, break up, dissolve*), from their supposed action in destroying or counteracting certain morbid agencies. The term employed to designate this class of remedies is certainly no more appropriate than the one formerly used—the agents included under this head forming the old class of *alteratives*. The action of this class of remedies is so obscure that we will defer what we have to say upon them till we come to consider *alteratives* as a special class.

The consideration of the *eighth*, *ninth* and *tenth* propositions may well be deferred until we treat of the classes specified in them. The propositions themselves state all we know of their mode of action.

On the Art of Prescribing Medicines.

Independent of the knowledge of diseases and the treatment of them, says Dr. Thompson, much of the success of the practitioner depends on circumstances connected altogether with the form in which the remedies are exhibited. In prescribing a medicine, even the best calculated to fulfill the object of the practitioner, it is necessary to consider the age, sex, temperament, habits and idiosyncrasy of the patient, before the dose can be properly apportioned; and, as far as the medicine itself is regarded, the most convenient and agreeable form of exhibiting it, whether it should be given alone, or combined with other ingredients, and how far these are likely to impede, modify, or facilitate its operation. An attention to these circumstances is absolutely requisite to prevent the errors which too frequently occur in forming a prescription.

FORMS IN WHICH MEDICINES ARE EXHIBITED.—Medicines are exhibited in the *solid*, *liquid* and *gaseous* state. *Solids* are employed internally in form of *powder*, *pill*, *bolus*, *electuary*, *conserve* and *lozenge;* and externally, of *cataplasm*, *ointment*, *cerate* and *plaster*. *Liquids* are employed internally in the form of *infusion*, *decoction*, *mixture*, *tincture*, *sirup* and *fluid extract;* and externally, of *baths*, *washes* and *liniments*. *Gases* are employed internally by *inhalation*, or by applying it locally to some of the mucous canals, as the vagina, rectum, etc.; externally they are applied in cases of local disease, or in the form of aqueous vapor to the whole surface, in cases of skin disease, or to produce perspiration.

Powders.—To form a powder, the remedy is finely comminuted, either by grinding, trituration in a mortar, levigation, elutriation, etc. It is the simplest, and perhaps the least objectionable form of preparing all remedies that can be reduced to powder; those agents, however, which are very unpleasant to the taste, those which deliquesce rapidly when exposed to the air, or are very volatile, or which are not readily diffused in water, can not with propriety be administered in this form. "Some substances can not be reduced to powder unless they be very much dried, and the heat necessary for that purpose alters their properties; even the impalpable form given to powders is injurious to some resinous substances, and we can not be surprised that a great alteration should be effected in a short time by the action of air on so great an extension of surface as takes in the operation usually adopted for reducing drugs to fine powder."

Many object to the employment of crude drugs in the form of powder, on account of the large size of the doses necessary, and from the fact that the woody and inert matter produces more or less irritation of the stomach.

The *active principles* of plants, as now obtained in the powdered form, are not liable to the above objections. The dose is small, there is no inert matter to produce irritation, and if the taste should be nauseous, it is easily disguised, owing to the small bulk of the agent.

Powders may be given in cold water, when they are readily miscible, and the taste is not nauseous; or in sweetened water. Resinous or heavy powders are best administered in mucilage or sirup; nauseous agents, if the bulk be small, may be enveloped in preserves, or administered in gelatine capsules.

Pills.—Pills are formed either of *extracts* having a proper consistence to take and preserve a rounded form; of dry solids which are combined with sirup, soap, extract of licorice, or some conserve, so as to form a pill mass; or of a tincture or fluid-extract combined with crumbs of bread, licorice, etc.

This form of administration is especially adapted for medicines which have a very nauseous taste or flavor, and such as require but minute doses to operate, or in cases where a slow action of the remedy is desired. They are objected to by many practitioners from the fact that a majority of patients have an aversion to pills, and because they are slow to act, not being as readily absorbed as when given in other forms.

Electuaries, Confections, Conserves.—Electuaries are mixtures of vegetable remedies, and light, earthy powders, combined by means of sirup or honey, so as to form a mass of tolerable consistence. Confections, or conserves, are vegetable matters beat into a uniform mass with refined sugar. In either case sufficient saccharine matter is employed to preserve as nearly as possible, the properties of recent vegetables, and prevent decomposition. In many instances this is a very available form in which to administer remedies, especially in the treatment of children. In some cases, however, the stomach will not tolerate the sugar, and in fever it is often detrimental to the patient.

Lozenges.—Lozenges, or troches, are powders mixed up with glutinous substances into little cakes, and afterward dried. They are adapted for the administration of remedies of a pleasant flavor, and especially where it is desirable to bring it in contact with the mouth, fauces, upper part of the air-passages, as in sore mouth, sore throat, coughs, etc. They are administered by slowly dissolving in the mouth.

We might here notice with advantage the two forms in which medicines are now so frequently exhibited—that of *extract*, and what are termed "*concentrated remedies*," or *proximate vegetable principles.*

Extracts.—Extracts are solid, or semi-fluid preparations, obtained by evaporating aqueous or alcoholic solutions of vegetable substances. When water is employed as the menstruum, they are termed *watery extracts*, and then consist of *gum*, *mucilage*, *albumen*, *extractive*, and *saccharine matter*, and such active principles as may be soluble in this fluid. They are generally very liable to decomposition, and owing to this fact, and that they contain large quantities of inert matter, the most of them are inferior preparations. When prepared with alcohol, they are designated as *alcoholic extracts;* and if water is employed in addition, *hydro-alcoholic extracts.* The two latter form when well prepared, and if the active principles are soluble in these menstrua, very efficient and eligible preparations.

Proximate Principles.—All vegetable remedial agents contain certain *proximate principles*, upon which the medicinal value of the agent depends. In these, when pure, there is no variation of strength, the physician knowing precisely when he prescribes them, how much medicine his patient will take, which can not be said of any other preparation. Of these principles we have the *alkaloid*, *resinoid*, *oleo-resinous*, *vegetable acids*, and *neutral substances.* Of these the two first are the ones in most common use. When "well prepared" they are, in a majority of cases, the best form in which vegetable remedies can be administered, "*but*" we have found by experience that it is not safe to take the word of every pharmaceutist who pretends to prepare these agents, that they are "*efficient agents*," or even that they are what they purport to be. We would be the last to throw discredit on concentrated medicines, yet we are confident that many inert agents, of this class, are palmed off upon the profession, greatly to the detriment, not only of the physician and his patients, but to the cause of reformed medicine.

Cataplasms.—Cataplasms, or poultices, are employed externally, to soften and relax the skin, and to exclude the air. They are formed of such substances as when wet will be somewhat tenacious, and accommodate themselves accurately to the part they are intended to protect. They may be employed solely with reference to the indications named, or they may be medicated by the addition of narcotic, stimulant, or other agents to the poultice.

Ointments.—An ointment is an unctuous substance, having a consistence but little firmer than lard, of which they are principally prepared. They are employed to bring medicinal agents in contact with the skin, by gentle rubbing, or more properly by inunction.

Cerates.—Cerates are unctuous compositions, possessing more firmness than ointments, on account of the wax which they contain, and from which they derive their names. Their consistence is such that they can be spread upon cloth, and thus form a dressing.

Plasters.—Plasters differ from cerates in possessing a much firmer consistence, so that the aid of heat is requisite to spread them, when they are pliable and tenacious, readily adhering to the skin. Each of these three forms of application may be employed to bring medicinal agents in contact with external parts, or through the skin to act upon internal organs; and, as it will readily be seen, one will be more applicable than another in certain cases.

Infusions.—An infusion is a solution of vegetable matter, obtained by maceration of the substance, either in cold or boiling water. A large proportion of vegetable remedies yield either a part or all their virtues to water by infusion; but in addition to the medicinal principles of the plant, water extracts the *gum*, *starch*, *mucus*, etc.

As far as success in practice is concerned, we have no doubt but infusion and decoction are the most eligible forms of administering such vegetable remedies as yield their properties to water. However much "*tea*" practice may be laughed at, we know that this practice has proven eminently successful in the hands of our old practitioners. In these forms the remedy is readily absorbed; there need be no doubt of its purity, or that it is well prepared; and again, it is certain in this case, that the patient will receive sufficient diluents, a matter that is of the first importance in the treatment of many diseases.

Infusions are objectionable, principally from the large size of the doses, and sometimes from the unpleasant taste of the remedy; the objection is also urged against them that they have to be often prepared, as they are liable to fermentation. Notwithstanding these objections we should prefer to administer remedies in this form providing the therapeutic properties of the agents could not be obtained in a pleasanter form. It may be supposed by the reader that this can be accomplished in every case, but our experience proves conclusively that some agents can only be administered in this form if we wish to obtain their full therapeutic action.

Decoction.—Decoctions are also solutions of vegetable matter in water, but they are obtained by boiling. They are intended to afford more powerful remedies than can be obtained by the simple infusion of the same substances in cold or even in boiling water; but, although by the operation of boiling, the solvent power of the water is increased, and a greater quantity of the soluble parts of any vegetable body are consequently taken up by it, yet it does not follow that the medicinal virtues of decoctions are greater than the infusions. On the contrary, if the active principles of a plant be volatile, or if they consist chiefly of extractive matter, this form of preparation often renders the remedy altogether inert, either by dissipating the volatile matters or by favoring the oxyzement of the extractive, which, in a continued temperature of 212° attracts the oxygen of the atmosphere so rapidly, that it is soon converted into a soluble, insipid, inert matter, and precipitated in the fluid. For these reasons only certain agents can be employed in this form with advantage, and it is an important point in studying the materia medica to impress the mind in regard to this point with any given agent.

Mixture.—A mixture in pharmaceutical language, is a preparation in which different ingredients insoluble in water are held in suspension by means of mucilaginous or saccharine matter. It is a very convenient and desirable mode of administering many remedies.

Tincture.—Tinctures are spirituous solutions of such of the proximate principles of vegetables and animals, as are soluble in either pure or diluted alcohol. From vegetable agents submitted to its action, dilute alcohol takes up *sugar, resin, extractive, the alkaloid and allied principles, volatile oils, camphor, tannin, most vegetable acids, etc.*, and in addition more or less of the resinoid principle upon which the virtues of many plants depend. Alcohol undiluted is employed where it is desired to extract all the resinous principles of some agents.

Tinctures are very available forms in which to administer such agents as are soluble in this menstruum, providing the agent employed possesses very active properties, so that it is administered in small doses. Or in case of stimulants and tonics, where the action of the alcohol is not disadvantageous. In ordinary cases where the dose of the remedy is large, and especially if sedatives, narcotics, etc., are to be administered, it is a very inappropriate form; the solvent, even in doses of a fluidrachm, often acting more powerfully on the living system than the principles it holds in solution. Again the continued use of these preparations produces the same deleterious effects as the habitual use of ardent spirits, and often lays the foundation of a morbid taste for spirituous liquors, and is the direct cause of intemperance and its train of fearful evils. The chief use of these preparations, says Dr. Thompson, is to enable infusions and decoctions, to which they are added, to sit lighter on the stomach, or to add to them some active principle which water is incapable of extracting. They are also useful as means of preserving the active ingredients of drugs without alteration.

Sirup.—Sirups are saturated solutions of sugar in water, either simple or medicated by the addition of some vegetable principle. Medicated sirups, in the Eclectic pharmacy, are frequently prepared by extracting the medicinal principles of plants with alcohol, which is then displaced, and the residue is formed into a sirup. It is not a very eligible form for the administration of remedies, but it is very frequently employed to render more active remedies palatable.

Fluid Extracts.—"Fluid extracts," according to Wood, are "highly concentrated solutions of the active constituents of medicines or the active constituents themselves, extracted in a fluid form." The menstruum employed in the preparation of these extracts is diluted or undiluted alcohol, depending upon the character of the principles contained in the plant; in their preparation a portion of the alcohol is displaced, and its place supplied with sugar. According to the pharmacopeias, one pint of the extract should be equal to one pound of the crude agent; but many of the Eclectic preparations are three, four, or five times this strength, in fact, "very variable."

If "well" and "carefully" prepared, this might be a very available form for the administration of many agents, as the preparations are usually pleasant to the taste, and do not contain sufficient alcohol to make them objectionable. But, from our experience with fluid extracts we should hesitate to recommend the majority of them as "highly concentrated solutions of the active constituents of medicines."

Baths.—Baths are either simple or medicated; in both cases they are employed either to directly affect the skin, or for their influence upon a general disease. In addition to their value in diseases of the surface, it is sometimes a very valuable method of affecting the general system. Washes are solutions of medicinal agents in water or other menstrua, and are principally employed for their local influence.

Liniments.—"These are compositions which have the consistence of oil or balsam, so as to allow them to be easily rubbed upon the skin. They are generally more active remedies than cerates or ointments, and act as local stimulants, relieving deep-seated inflammations and pains."

Of the Form and Composition of Extemporaneous Prescriptions.—In every prescription, says Dr. Thompson, simplicity should be kept in view, and when one medicine will answer the intention of the prescriber, it ought to be preferred. The nauseous taste, however, and the other qualities of a great majority of drugs, require the addition of others to modify their action; but although medicines are more generally prescribed in a compound form, yet the practice of accumulating a great variety of ingredients in one prescription must be avoided.

Medicines exhibited in the fluid form operate sooner and with more certainty than in the solid state; but in choosing the vehicle or solvent, the taste of the patient ought not to be overlooked. Thus, for those to whom peppermint-water is not disagreeable, the nauseous taste of sulphate of magnesia is more completely concealed by that vehicle than any other; if cinchona bark in powder be ordered, milk effectually covers its taste, provided the dose be taken the moment it is mixed; and if aloes, the most nauseous article of the materia medica, be prescribed in a fluid form, a solution of extract of liquorice renders it by no means unpalatable. Medicines which, when given alone, produce griping, require the addition of aromatics to correct that quality; and when they operate with violence, mucilages and demulcents are sometimes necessary to soften their acrimony, or narcotics to moderate their action. In the use of concentrated remedies, especially resinoid preparations, it is of much advantage to triturate them with sugar or sugar of milk, not only for the purpose of rendering them more soluble, and thus increasing their activity, but also to prevent irritation of the stomach and intestinal canal. In prescribing cathartics, it is often important to consider the part of the alimentary canal on which we wish them to act. Thus, rhubarb, sulphate of magnesia, leptandrin, etc., act chiefly upon the duodenum; jalap, podophyllum and juglandin upon the lower part of the small and large intestines; aloes on the rectum, and bitartrate of potassa upon the entire length of the canal. Another reason for prescribing medicines in combination is the frequent need of fulfilling two or more indications at the same time. Thus, the same dose may be required in colic, to allay pain and evacuate the bowels, or in fever to determine to the surface, to allay irritation and produce sleep. But in combining medicines, care should be taken not to bring together *incompatibles*, or substances that decompose each other, or chemically combine, altering the nature of the mixture, and forming new compounds, which may be entirely different from the agents employed—without, indeed, the resulting compound is the agent desired. Thus acids and alkalis are incompatible, unless the neutral salt they produce be the remedy required.

The following are the objects to be obtained, says Dr. Paris, by mixing and combining medicinal agents:

OBJECT 1. To promote the action of the basis or principal medicine.

a. By combining the several different forms or preparations of the same substance.

b. By combining the basis with substances which are of an analogous nature, i. e., which are individually capable of producing the same or kindred effects.

c. By combining the basis with substances of a different nature, and which do not exert any chemical influence upon it, but are found by experience, or inferred by analogy, to be capable of rendering the stomach, or system, or any particular organ, more susceptible of its action.

OBJECT 2. To correct the operation of the basis, by obviating any unpleasant effect it might be likely to occasion, and which would pervert its intended action, and defeat the object of its exhibition.

a. By chemically neutralizing or mechanically separating the offending ingredients.

b. By adding some substance calculated to guard the stomach or system against its deleterious effects.

OBJECT 3. To obtain the joint operation of two or more medicines.

a. By uniting those substances which are calculated to produce the same ultimate results, but by modes of operation totally different.

b. By combining medicines which have different powers, and which are required to obviate different symptoms, or to answer different indications.

OBJECT 4. To obtain a new and active remedy not afforded by any single substance.

a. By combining medicines which excite different actions in the stomach and system, in consequence of which new or modified results are produced.

b. By combining substances which have the property of acting chemically upon each other; the results of which are:

1st. The formation of new compounds;

2d. The decomposition of the original ingredients, and the development of their more active elements.

c. By combining substances, between which no other chemical change is induced than a diminution, or increase, in the solubility of the principles in which their medicinal virtues reside:

1st. By the intervention of substances that act chemically;

2d. By the addition of ingredients whose operation is entirely mechanical.

OBJECT 5. To afford an eligible form.

a. With reference to its efficacy.

b. With reference to its taste or appearance.

c. With reference to its consistence or equable mixture.

d. With reference to its preservation.

In writing a prescription, the practitioner should, if possible, use pen and ink, and the name of each ingredient should be given at full length; or if abbreviated, the abbreviation should be one in common use, and which will be readily understood by the pharmaceutist. The prescription should, in every instance, be written in a plain, legible hand, with the symbols correctly given, and full directions as to dose and time of administration, and should be carefully re-read after it is written, in order to ascertain its correctness. In writing a prescription, the first object is the principal or most active ingredient, which is called the *basis;* the next, the *adjuvans,* or that which is designed to promote the action of the first; the third, the *corrigens,* or that designed to correct or modify the action of the principal remedy; and fourth, the *vehiculum,* or that in which the agents are to be administered. In writing a prescription, it is not always advisable to place the different agents in the order just named, but in the mode best fitted for compounding the medicine. Thus, salts and other soluble solids should be placed before the menstruum in which they are to be dissolved; and volatile agents should always be placed last, as they are necessarily the last ingredient added in the manipulation of the compound. When an infusion, decoction, or even poultice, is ordered to be prepared in the patient's house, it is always necessary to give specific directions to the one who is to prepare it; otherwise, in many instances, the remedy will be so poorly prepared, that no benefit will result from its use.

In country practice, where the practitioner furnishes the medicine, it should always be a rule to keep every thing in the office properly labeled, and never let a package of medicine be dispensed unless it is plainly marked with directions for use. An observance of the rules just laid down, though they may seem of minor importance, will sometimes prevent serious mistakes, and always show a laudable care for the welfare of the patient.

Circumstances connected with the State of the Patient.—Of these, we have to notice the *age*, *sex*, *temperament*, *habits*, *idiosyncrasy*, *disease*, *climate*, *mode of living*, *mental action*, and to some degree the previous diseases of the patient, as very important considerations in the administration of remedies.

Age.—In works on materia medica, the doses named, and the description of the therapeutic action of different remedies, apply to the treatment of adults, without the contrary is stated. As far as the dose of an agent is concerned we may, in most cases, consider the following table, originally drawn up by Gabius, as a sufficient guide for the young practitioner:

AGES.	PROPORTIONAL QUANTITIES.	DOSES.
For an adult, suppose the dose to be	*One*, or	1 drachm.
Under 1 year, will require only	1-12th, or	5 grains.
Under 2 years, will require only	1-8th, or	7½ grains.
Under 3 years, will require only	1-6th, or	10 grains.
Under 4 years, will require only	1-4th, or	15 grains.
Under 7 years, will require only	1-3d, or	1 scruple.
Under 14 years, will require only	1-2, or	½ drachm.
Under 20 years, will require only	2-3ds, or	2 scruples.
Above 21 years, the full dose.		
Above 65 years, the inverse gradation of the above.		

All tables, however, can be regarded but mere approximations, and can not apply to all remedies. Thus in early life the system is very susceptible to the action of narcotics, especially to opium, so that these agents if administered at all, should be given in much less than the proportionate dose;

while of castor-oil and some other agents much more than the dose named is required to produce their effects. Again, it must be recollected that in early life the mucous membrane of the stomach and alimentary canal is very susceptible to any cause of irritation, and hence irritant remedies should always be avoided. One of the authors, in his early practice, found that he met with much less success in the treatment of diseases of children than any other class of cases, and less than some of his professional brethren; he attributed it to the administration of such agents as were not readily soluble in the stomach. Convinced that such remedies did in many cases produce irritation of the gastric mucous membrane, with its train of unfavorable symptoms, he resolved that under no circumstances would he administer them, and by carefully selecting such remedies as would not produce irritation, he has found infantile cases to yield as readily to treatment as any others. From one to three years of age we find a peculiar erythism of the mucous membrane of the alimentary canal, or at least an increased predisposition to irritation, which is undoubtedly the cause (providing we do not attribute it to the medication) of a large proportion of the mortality at this age. Here especial care should be used, not only in not giving agents which produce irritation, but in constantly guarding against it by the employment of such measures as we well know counteract it. We must also notice the fact of the acute, nervous sensibility of the patient at this time, and that very great advantage may be gained by impressions made upon the skin of a soothing and agreeable character. Hence it is that baths of various kinds at this age become among our most important means of cure. In old age it is generally stated that the doses of medicines should be decreased; but this is not on account of an increased sensibility to the action of medicines, for the reverse is the case; but because the strength of the patient is unable to sustain, without injury, the same impression from a remedy as in the full vigor of life.

Sex.—Although some females possess as much bodily strength and vigor of constitution as the majority of men, and require as large doses of medicine to produce a given effect, yet the greater delicacy and sensibility of the female frame, as a general rule, requires not only caution in apportioning the doses of active medicines, which should be less than those ordered for men of the same age, but the medicines themselves should be such as are likely to fulfill the indications required without much violence.

The state of the uterine system too must not be overlooked, for the periods of menstruation, pregnancy and lactation are attended with peculiarities in relation to the action of medicines. Thus the employment of aloëtic and drastic purgatives must be suspended during the catamenia and period of pregnancy; agents likewise which exert any powerful influence upon the system should not be administered at these times. Agents which are absorbed and communicate injurious properties to the blood, should be avoided during pregnancy and lactation; so too should all cathartic or other medicines which communicate their properties to the milk of the mother, while she is nursing.

Temperament.—It is doubtless true that temperament exercises a great and important influence over the action of medicines; yet temperaments are so poorly described, and the facts so illy defined in regard to their therapeutic relations that we are almost tempted to pass the subject by, as one that can only be learned by long practice. The *sanguine* temperament does not bear stimulants well, and is very readily affected by *quinine* and *morphia*, as is also the *encephalic;* while persons of a *lymphatic* temperament will generally require increased quantities of all remedies to produce a certain effect. We might consider the *bilious* temperament as the medium between the two named, the sanguine and the encephalic being more and the lymphatic less sensitive to the action of remedies.

Habit.—Under this head we shall consider only the previous habits of the patient in regard to taking medicine, and the influence that this will subsequently have in modifying the effects of remedies. Persons addicted to the use of spirits, narcotics and other stimulants, are less easily excited both by medical stimulants and narcotics; and the knowledge of the habits of a patient, as far as the exhibition of purgatives is concerned, is absolutely necessary for the prescriber—many people being in the almost daily habit of taking this class of remedies without consulting a medical practitioner. In the first of these cases, larger doses of stimulants and narcotics are required to produce the ordinary effects of those remedies; but in the second a change of the purgative usually taken will generally be sufficient. It should, however, be recollected that in prescribing a narcotic which has not previously been taken, the dose should be no larger than usual. In the employment of most remedies which require to be long continued, the dose will have to be increased in order to produce the necessary effect. In some cases, indeed, a remedy will entirely lose its influence upon the system, when by substituting another having a similar action, the full effect will be produced.

Idiosyncrasy.—The individual peculiarities, or as the term is, *idiosyncrasy* of patients to the action of remedies, is of much importance, and can not be too carefully considered by the physician. It is well known that many persons are peculiarly affected by substances taken into the stomach, either in the form of food or medicine, in a manner different from the majority of mankind. Such cases are generally only discovered by accident or time; but the practitioner called to attend on a patient for the first time, should always inform himself in regard to this particular as well as he can, never neglecting such information as may be volunteered by the patient or his friends. Any facts obtained in this way, or accidentally discovered, should be stored up in the memory for future guidance when treating the same patient. A physician who, from long attendance upon a patient, is thoroughly acquainted with all his constitutional peculiarities in regard to the effects of medicines, has much greater advantages in treatment than one who has all this to learn. Hence we have here a good reason for the preference of patients to their family physicians, and a strong reason against the very prevalent custom of many Eclectic physicians changing their location every year or two.

Peculiarities in the effects of medicines are sometimes generated by disease; a remedy having an entirely different action from what was expected, or even from what it had had at previous times.

As examples of these idiosyncrasies, might be mentioned the well-known effects of ipecacuanha, in causing in some persons, merely by its smell, severe asthmatic attacks; the cutaneous eruption sometimes produced by copaiba and the turpentines; and the very singular and inconvenient effects of opium and its salts, upon some persons, etc. In some instances the effect of the idiosyncrasy is to render the patient much more susceptible to the action of remedies; while in others it has a contrary effect.

Disease.—The character of the disease always has more or less effect in modifying the action of remedies. Thus the susceptibility of the patient to the action of medicines is sometimes greatly increased, while at others it is greatly diminished. Again, new susceptibilities are occasionally manifested, and effects wholly unexpected produced. Thus, in irritation or inflammation of the stomach, very minute doses of an emetic will act promptly, while in certain affections of the nervous system, as delirium tremens for example, it is hard to produce emesis with the largest doses of the remedy. In certain conditions of the brain, small doses of opium will excite to phrensy; while in others, as in tetanus, mania, etc., the largest dose will produce but little effect. In diarrhea opium checks discharges from the bowels, while in spasmodic colic it favors the action of cathartic medicines. Numerous other examples of this might be noticed; but in this place all that is necessary is to direct the mind of the reader to the fact, and the importance of bearing it in mind in the study of disease, and the agents to be used in combating it.

Climate.—Climate modifies the action of medicine by altering the condition of the system. Thus, in warm climates, the muscles, the heart and arteries lose power and tone, the textures become relaxed, perspiration is profuse, and internal organs, especially the liver, are too much stimulated by blood, which has lost more than usual of its water, and less of its hydro-carbon. Hence the importance of using with caution such remedies as act with harshness upon the alimentary canal, or upon the liver. There is also a marked tendency in diseases to assume a typhoid or adynamic form, which should teach us the impropriety of using agents which debilitate the system, and the absolute necessity of using such means from the beginning as will keep up the vital powers. In miasmatic regions, it will often be found that agents which prove curative in similar diseases in other parts of the country, will have but little, if any effect; the disease being controlled, if we may so speak, by the intermittent influence. Here the agents termed *anti-veriodics* will produce effects that we would not expect in disease where this influence is wanting. The influence of climate in the production of disease, and the action of remedies has not as yet been sufficiently investigated, and we have not therefore the data to give, even if we had the space, a full account of its bearings. It is, however, a fruitful field of inquiry, and one the cultivation of which will add much to our practical resources.

Mode of Living.—This like climate modifies the action of medicines by altering the condition of the system. It would be impossible, however, in this place, to notice all its bearings; all that we wish to do, being to call attention to its existence. In persons of vigorous health and accustomed to out-door exercise, we find disease almost always assuming a sthenic type, and remedies, as a general rule, will have to be administered in larger doses to produce their effects. This is not, however, the case with cathartics, which, when they have not been habitually used, generally operate in small doses; while in persons of sedentary habits, we usually find habitual constipation; to remove which, larger doses of medicine are generally requisite. Extreme mental exercise predisposes to affections of the brain, and in disease of such persons care will be required to administer nothing that will increase this predisposition. Want of exercise and sedentary habits not only predispose to certain forms of disease, but likewise exert an influence upon the action of medicinal agents. Thus, if we except cathartics, remedies require to be administered in smaller doses, debilitating agents have to be avoided, and much care is requisite to support the vital powers of the system.

Mental Action.—There can be no doubt but that the state of the patient's mind materially influences the action of medicines. As a general rule, they will act with greater certainty and more promptly, if the patient knows they have been given to produce a certain effect. Indeed we have known effects produced from a harmless placebo, which were owing entirely to the mental impression that such results would occur. This, however, is not always the case; for instance, we order three or four doses of opium, one to be given every hour until the patient goes to sleep; the patient knowing the directions, the probability is, that the the expectation and watchfulness for the next dose will prevent sleep until all are taken, though one dose under ordinary circumstances would have produced the required effect. Faith in the physician and the medicines administered, is often of more benefit than the remedies themselves. We have seen diseases treated without any benefit by one physician, when the same remedies continued under the direction of counsel in whom the patient had implicit confidence, produced the most marked beneficial effect. From these facts the reader will see the importance of gaining the confidence of the patient in all cases, but more especially in nervous and chronic forms of disease.

Previous Diseases of the Patient.—The character of previous diseases sometimes has an important bearing on the administration of medicines. Thus, to persons who have had chronic inflammation of the stomach, it would be injudicious to administer drastic or irritant medicines: the same may be said where chronic or recent acute inflammation of the small intestines has existed. Where a patient has been subject to hemorrhoids, although not existing at the present time, it would be highly improper to administer aloëtic or drastic purgatives. Where chronic disease of the kidneys has existed, we would be careful how we administered irritant diuretics, etc. All these circumstances in the previous history of the patient, should be inquired into and carefully weighed, and the exhibition of remedies governed accordingly. The great success of some practitioners depends in part upon the care with which they gather and consider all these circumstances; while the want of success by many is no doubt owing to their considering them beneath their notice.

PART II.

SPECIAL THERAPEUTICS.

Special Therapeutics is that branch of medical science which treats of the application of special remedies in the cure or alleviation of disease. Under this head we will consider the different agents in classes, and the application of these classes in the treatment of special forms of disease, and then examine each individual agent in the same manner. It is not the intention of the authors to make what might be called a strictly scientific classification of agents, but to make such an one as they think will give the student and general reader the clearest view of the subject. The intention is to sacrifice every thing that is not strictly practical—to make the work a full, safe and reliable guide to the practitioner.

In the classification of remedies, those will be considered first that are most frequently indicated in the treatment of those diseases that make up the major part of daily practice.

The first general division may be termed *eliminatives*, from their principal influence upon the system—eliminating morbid materials from it. This will be divided into four classes. *emetics*, or those agents that produce evacuation from the stomach; *cathartics*, those that cause evacuation from the bowels; *diaphoretics*, those that cause an increased secretion from the skin; and *diuretics*, those that cause an increased secretion from the kidneys.

The second division may be termed *neurotics*, because their principal influence is exerted upon the nervous system. This will be divided into three classes: *sedatives*, or those agents that depress nervous energy, without producing any previous excitement; *narcotics*, those that first exalt and then depress nervous energy, and also produce sleep; and *stimulants*, agents which increase the evolution of nervous force. To this may be added a fourth class, termed *anæsthetics*, agents which deaden the sensibilities of the system, and render the patient unconscious of pain.

The third division embraces those agents that act principally upon the blood, and hence may be called *hematics*, or blood medicines. These may be divided into two classes: *tonics*, or agents that restore the normal quantity and quality of this fluid; and *alteratives*, those agents that alter, destroy, or remove any morbid material from the blood.

The fourth division embraces incidentally all those agents that act by revulsion, producing a new point of irritation, directing to this the vascular and nervous afflux, and in this way relieving disease of more important parts. It embraces but a single class, which from their action take the name of *revulsives*.

The fifth division embraces but a single class, called *astringents*, agents which cause contraction and condensation of the tissues of the body.

The sixth division embraces but a single class, *expectorants*, agents that increase the secretion of the pulmonary mucous membrane, and favor its evacuation.

The seventh division consists of those agents that counteract putrefaction, or the septic tendency, and are, in consequence of this action, termed *antiseptics*.

The eighth division embraces those agents that act specifically upon the uterus, and may be divided into three classes: *emmenagogues*, agents that promote the menstrual secretion; *parturients*, those that increase the expulsive efforts of the womb, and accelerate the process of parturition; and *abortives*, agents supposed to effect the dislodgment of the fetus in utero, producing abortion.

The ninth division embraces all agents that counteract spasmodic action, the single class being termed *antispasmodic*.

The tenth division embraces the internal remedies and local applications used for the purpose of reducing the temperature of the entire system, or of a particular part. The class is termed *refrigerant*.

The eleventh division embraces but a single class, *anthelmintics*, agents which destroy or cause the evacuation of worms.

The twelfth division embraces two classes that increase special secretions: *sialagogues*, those agents that increase the salivary secretion; and *errhines*, agents that increase the nasal secretion.

The thirteenth division embraces two classes, the action of which is chiefly chemical; they are *antacids*, agents which neutralize acidity, and *antilithics*, agents that counteract the tendency to the formation of calculous deposits.

The fourteenth division embraces three classes which act mechanically; they are *demulcents* and *emollients*, agents which soften and relax the tissues to which they are applied, and shield them from irritation, and *diluents*, agents which augment the fluidity of the blood and other animal fluids.

The fifteenth division embraces a single class of agents, called *antidotes*, agents capable of neutralizing or lessening the action of poisons.

The following table will exhibit this classification;

1. Eliminatives	Emetics	Agents that evacuate the stomach.
	Cathartics	Agents that evacuate the bowels.
	Diaphoretics	Agents that increase the secretion of the skin.
	Diuretics	Agents that increase the secretion of the kidneys.
2. Neurotics	Sedatives	Agents that lessen nervous sensibility.
	Narcotics	Agents that produce sleep.
	Stimulants	Agents that increase nervous energy.
	Anæsthetics	Agents that produce insensibility.
3. Hematics	Tonics	Agents that give tone to the system.
	Alteratives	Agents that modify organic action.
4. Revulsives		Agents that cure by producing a new point of irritation.
5. Astringents		Agents that cause condensation of the tissues.
6. Expectorants		Agents that increase and favor expectoration.
7. Antiseptics		Agents that counteract putrefaction.
8. Uterina	Emmenagogues	Agents that promote the menstrual secretion.
	Parturients	Agents that excite contraction of the uterus.
	Abortives	Agents that produce abortion.
9. Antispasmodics		Agents that counteract spasms.
10. Refrigerants		Agents that diminish the heat of the body.
11. Anthelmintics		Agents that remove worms.
12. Sialagogues		Agents that increase the secretion of saliva.
Errhines.		Agents that increase the nasal secretion.
13. Chemica	Antacids	Agents that neutralize acidity.
	Antilithics	Agents that prevent calculous formations.
14. Mechanica	Demulcents	Agents that shield the tissues.
	Emollients	Agents that soften and relax them.
	Diluents	Agents that increase the fluidity of the blood.
15. Antidotes		Agents that counteract the action of poisons.

DIVISION I.

CLASS I.

EMETICS.

Emetics are a class of remedial agents which by producing a specific impression upon the sentient nerves of the stomach, or upon the nervous centers, are capable of exciting vomiting. Emetics may be divided into two classes, according to their mode of action: the first class prove emetic by their irritant effect upon the mucous membrane, and sentient extremities of the nerves of the stomach; the second, by being absorbed into the blood either affect the nerve centers, or by having a specific affinity for the mucous membrane of the stomach act there upon the terminal branches of the pneumogastric nerve.

Action of Emetics.—The action of both of these classes of emetics is similar in some respects; that is, in both the impression is transmitted to the pneumogastric nerve, or to the medulla oblongata, from which it arises; this excites the sensation of *nausea*, which is referred to the stomach. The reflex action is transmitted downward through the spinal cord to the muscles concerned in the process of evacuation, calling into action the muscles of the larynx, the diaphragm, and the abdominal muscles. The act of vomiting may be thus described: the patient first draws a quick, deep breath, the rima-glottidis is spasmodically closed to prevent the egress of the air, and thus prevent the diaphragm from being forced upward. The muscle of the stomach itself contracts, and the pylorus is at the same time forcibly closed; the abdominal muscles contracting press the stomach against the diaphragm, but being unable to act upon it, the stomach, which endures the pressure, is forcibly emptied of its contents.

The action of a *specific* emetic is not dependent upon the quantity, the nauseating taste, or the unpleasant smell of the article; some of the most energetic emetics will act very efficiently in minute doses, while the same article may have but little taste, and be entirely devoid of offensive odor.

A like result follows from injecting them into the veins, or into the rectum, and not unfrequently from their external application; showing most conclusively that emesis is induced by the specific influence which they exert upon the nervous centers.

Specific emetics always produce more or less nausea and relaxation of the system, whether their action is carried to emesis or not; while on the contrary, *irritant* emetics produce but little nausea, but merely a feeling of discomfort in the stomach.

The susceptibility to the influence of emetics is extremely variable in different persons, and a difference not unfrequently manifests itself in the same person at different times, depending upon the character of the disease, and a variation in the gastric sensibility of the patient. A dose that will scarcely affect one, may produce *hyper-emesis* in another, or in the same person at another time.

THERAPEUTIC INDICATIONS.

Emetics are employed in a diversity of diseases, and to fulfill a great variety of indications. They make a very powerful impression upon the system, and often effect important changes in the pathology of disease. Emetics are often valuable, and even very important agents when no specific disease exists, as well as in the opposite condition. When a train of morbid sensations, and an extensive chain of perverted sympathies exist, emetics are important agents in revolutionizing the whole system, and breaking up that concatenation of depraved sympathies.

We shall next proceed to notice, in detail, the various indications which emetics are capable of fulfilling, and their adaptation to the treatment of different diseases.

I. *Evacuation of the Stomach.*—They are valuable for the purpose of evacuating the stomach when that organ is overdistended with indigestible articles of food that oppress it, and thereby disturb the normal condition of the system. They are also useful when a redundancy of acid, or mucus is generated in the stomach. The nausea and vomiting which take place in such cases, pain in the stomach or head, or the "*sick-headache*," are often relieved by their use. When from an inverted peristaltic action of the duodenum, acrid, bilious matter is thrown into the stomach, when any vitiated accumulations take place in that organ, or when poisons, particularly those of the narcotic kind, are lodged in the stomach, emetics are pre-eminently useful for the purpose of ejecting the offending matter.

II. *Action in Febrile Diseases.*—Emetics are valuable therapeutic agents in the treatment of febrile diseases in general. During the early stages of almost all attacks of fever, the employment of emetics is of unquestionable importance. In the various forms of intermittents, and bilious remittents in particular, this class of agents may be administered with much advantage. They are also found useful during the early stages of typhus, typhus icterodes, continued, and synochal grades of fever.

1st. In the intermittent and bilious remittent fevers, and even in other types, when there are evidences of a morbid biliary secretion being thrown into the stomach by the inverted action of the duodenum, or in any case where there are vitiated materials accumulated in that organ, producing irritability, nausea, and a morbid sensibility, emetics are exceedingly valuable for the purpose of quieting that irritability, removing those vitiated materials, and for preparing the stomach for the reception and retention of other medicines, which would be rejected if it were not for this preparatory treatment. The removal of the vitiated secretions of the stomach, and such food as may be undigested, is of the first importance in all cases, for if not removed in this manner they are excreted by the bowels, and in their passage more or less is absorbed and conveyed into the circulation, thus vitiating the blood-fluid. They are not only of use in checking nausea and vomiting, which often prevent the use of the necessary remedies, but by their cleansing and exciting influence on the mucous membrane, they promote the ready absorption of agents which are administered after their action.

2d. By their mechanical action they compress the liver and abdominal viscera, they remove visceral congestions, overcome obstructions in the liver and portal circle, stimulate the chylopoietic viscera and glands of the intestines to action, give a powerful shock to the nervous system, and break up the morbid associations and diseased sympathies which often sustain and keep up the recurrence of the febrile paroxysms.

3d. The shock which they give to the nervous system is very frequently the means of arresting the disease, and restoring the patient to health, if resorted to before the system becomes prostrated, or the disease fully seated. They break the chain of pathological associations, substituting their own impression for that of the existing disease, and break up or counteract the periodic tendency.

4th. An emetic given a short time before the expected attack of the cold stage of ague, in order to have it in full operation at the time of the paroxysm, not unfrequently arrests it; and should it not, it renders it much milder—the cold stage is of shorter duration, and the reaction is comparatively feeble. They also prepare the system for the reception of tonics, whose remedial powers seem to be materially augmented by premising their administration with an emetic.

5th. They promote the secretion and remove congestion of the lungs, and thus aid in decarbonizing the blood; they also increase the renal, gastric, biliary and pancreatic secretions, and by their mechanical effects upon the abdominal viscera, and their influence over the hepatic secretions they often produce copious alvine evacuations. They thus prove depurative, removing from the blood the products of disintegration and chemical change, the presence of which is often as we have already seen a proximate cause of these diseases.

6th. By nauseating and relaxing the system, they most effectually overcome that spasmodic and constricted condition of the cutaneous exhalents which attends fever, and thus lessen the exalted action in the cutaneous capillaries, and consequently the abnormal generation of caloric which attends their increased activity.

7th. They act indirectly as sedatives, depressing the vascular and nervous excitement, thereby promoting diaphoresis. The cutaneous exhalation acts indirectly as a refrigerant, by the evaporation which takes place from the surface, in this way counteracting the abnormal generation of caloric.

These influences properly carried out, tend in a very powerful manner to lessen the intensity of the excitement, and to hasten the supervention of convalescence.

8th. By increasing the secretions in general, but particularly those of the lungs, liver, kidneys and skin, they act as depletives; and in this way supersede the necessity of resorting to the lancet. During the period of nausea and relaxation, they serve to depress the vascular and nervous action, and exert a sedative influence over the circulation; thus again, just as surely, and much more safely, fulfilling those indications for which the lancet is said to be alone adequate.

9th. They exert a revulsive influence, by making the stomach the center of an artificial fluxion, and thus detracting from the inflammation or congestion existing in some other organ. This influence is one of great importance in the treatment of all diseases, but particularly those of an inflammatory character; since by counteracting local congestions by virtue of their strong centrifugal influence over the circulation, they aid in a very powerful manner in equalizing the circulation and nervous excitement.

III. *Action in Diseases of the Respiratory Apparatus.*—Emetics are very important remedies in the various forms of pneumonia: in pleuritis, in pneumonia biliosa, in peripneumonia or in pneumonia proper, frequent gentle emetics will be found of great utility. Some have objected to the use of this class of remedial agents in the treatment of pneumonic inflammation, in consequence of the mechanical compression attending emesis. It has been asserted that they aggravate the sufferings of the patient and the intensity of the disease; but experience has fully convinced us that the objection urged against their use in this respect is not valid, especially when the mild vegetable agents to which we resort, are substituted for the poisonous minerals in common use in the old system of practice.

1st. In the most violent forms of pleuritic inflammation emetics administered in nauseating doses, for some time before full vomiting is desired, aided by copious draughts of warm diaphoretic infusions, will in a very short time produce a general relaxation, and a free perspiration; and when the system is thus brought under the influence of emetics, vomiting, instead of aggravating the sufferings of the patient, will generally give prompt and in many cases entire relief. The violence of the pain, and the respiratory suffering will be speedily mitigated, and will not be attended with a subsequent recurrence.

2d. In the various forms of pneumonia the smaller bronchial tubes and air-cells of the lungs will be found obstructed or loaded with a viscid tenacious mucus, unless the intensity of the inflammation has arrested the secretion. If it is arrested, emetics by their sedative influence upon the system, will diminish the inflammation and restore the secretion. If the secretion has not been arrested, and the bronchial tubes and air-cells are loaded with it, an emetic will be found exceedingly valuable in removing the obstruction.

They likewise exert many other salutary influences upon the system in the treatment of these diseases. They are important expectorants, they are valuable as diaphoretics and revulsives, they equalize the circulation, they act as depletives, they depress the vascular and nervous excitement, and exert a very powerful influence in subduing the inflammation.

They are equally applicable in the treatment of the various forms, and different stages of pneumonic inflammation, unless there is extreme prostration.

3d. Emetics are by no means an unimportant class of agents in the treatment of the various forms of cynanche, especially so in that form designated as croup. The speedy relief which they often afford in that disease is truly surprising. In cases where the patient is threatened with immediate suffocation, from the accumulated mucus in the larynx, trachea and bronchia, or from the pseudo-membranous formation which is the result of the inflammatory action in the larynx, an emetic will frequently give prompt relief. In order to secure the full advantages which this class of agents is capable of affording in this disease, it becomes necessary to repeat them frequently, and in some cases, much advantage will be gained by giving them so as to keep up a constant nausea and occasional vomiting for several hours.

4th. *Asthma* is another disease in which emetics are prominent remedies. They invariably give temporary relief, if taken during the asthmatic paroxysm; and if the patient is young, or the disease not too firmly seated in the constitution, an energetic and persevering course of emetics, assisted by suitable expectorants, together with auxiliary means both dietetic and medicinal, will do much toward effecting a radical cure. They are also valuable in *hooping-cough*, *nervous-cough*, *chronic bronchitis*, and the various *catarrhal* diseases occurring during the cold and variable seasons of the year.

IV. *Action in the Exanthemata.*—They are very useful in the exanthematous diseases, as measles, scarlatina and small-pox, especially in the early stages. When the pharynx and contiguous parts are ulcerated, inflamed, and swollen to such an extent as to impede respiration and deglutition, emetics will lessen the inflammation and swelling, cleanse the ulcers, remove the viscid secretions, establish a new action in the parts, equalize the circulation, act as diaphoretics; and if there is oppression of the lungs, which is frequently the case, especially in measles, they will remove it. They fulfill many other indications in these diseases. Thus, during the early stages of these complaints, if the eruption is tardy in making its appearance upon the surface, or when it has appeared, and a retrocession has taken place, emetics, by producing a determination to and relaxation of the skin, will bring it again to the surface.

V. *Action in Rheumatism.*—Emetics are occasionally employed in *gouty* and *rheumatic* affections with much advantage. When an arthritic habit obtains, a dyspeptic state of the stomach is generally present, in many cases a redundancy of acid being generated, in which event a course of mild emetics will do much toward arresting the paroxysms; and used in conjunction with proper restoratives, they will very materially aid in eradicating the arthritic habit. In inflammatory rheumatism, and even in the chronic form of this complaint, emetics, if given to keep up a constant nausea and diaphoresis, and to such an extent as to occasionally produce emesis, will recommend themselves as effective agents. They remove any morbid secretions from the stomach, subdue inflammatory action by their sedative and diaphoretic influence, and by acting as revellents, equalize the circulation.

VI. *Action in Hepatic Affections.*—In chronic hepatic affections, in torpor of the portal circle, in visceral obstructions, and in diseases of the glandular and lymphatic systems, emetics are useful in removing the torpor, and restoring the various organs implicated to a normal performance of their functions. The influence which they exert upon the sympathetic system of nerves, and the shock which they impart to the whole system in the act of vomiting, by the severe compression of the abdominal viscera, and by exciting a new action in the nervous, vascular and lymphatic systems, tends to prepare the patient for the reception of *tonics* and *alteratives*, when their influence will be doubly appreciable. In *jaundice*, experience decides in favor of their employment. If the biliary ducts are obstructed by calculi, producing jaundice, or if it arises from hepatic torpor, or functional derangement of that organ, emetics are valuable for removing the obstruction, by compressing the liver in the act of vomiting, and in arousing and restoring the healthy secretory functions of that organ.

VII. *Action in Dyspepsia.*—Gentle emetics are very useful in the treatment of *dyspepsia*, dependent upon debility or functional derangement of the stomach. Frequent mild emetics remove the morbid accumulation of acid and mucus from the stomach, and counteract the tendency to their generation; they remove the oppressed state of the stomach, induced by the presence of these morbid accumulations. In such conditions, the digestion is impaired, the gastric juice is vitiated, and its solvent properties weakened, chymification is imperfect, and the chyle is unhealthy. The intimate sympathetic relations existing between the digestive apparatus and the brain, are manifestly deranged by this unhealthy state of the stomach. Emetics are important for the purpose of counteracting this condition of the stomach, and the morbid sympathies which arise from it.

VIII. *Action in Hypochondriasis.* — Hypochondriasis is another disease in which emetics frequently prove beneficial. They often arouse the mental and physical energies of the hypochondriac, and dispel those gloomy forebodings which are essential characteristics of that disease; they also increase the susceptibilities of the system to other remedies. In this disease there generally exists a congestion of the portal circle, and a torpid and deranged state of the digestive organs, and a morbidly sensitive state of the brain and nervous system; in these conditions we have often witnessed the salutary influences of emetics.

IX. *Action in Mania.*—Emetics are also administered with much advantage in mania, arising from intemperance. In such cases the extreme insensibility of the stomach, sometimes requires that they should be administered in unusually large doses. In ordinary intoxication, they will evacuate the stomach, lessen the cerebral oppression, arouse the sensibilities of the nervous system, and restore the inebriate to a state of sobriety and consciousness more speedily than any of the ordinary remedies with which we are acquainted. If mania has arisen from the too free use of alcohol, an emetic not only evacuates the stomach, and thus removes the exciting cause, but it acts as a sedative, revellent, and an antispasmodic; it equalizes the nervous energy and excitement, and in many cases subverts the morbid habit.

X. *Action in Diseases of the Brain and Nervous System.*— In relation to their employment in *apoplexy*, a contrariety of views prevails. When apoplexy attacks a patient while the stomach is in a state of engorgement, the use of an emetic is of primary importance; but as a general rule their use is highly improper, and often dangerous. In this disease, as well as in all others in which the brain and nervous system are deeply involved, much larger doses will be required to accomplish the desired object.

Congestion, irritation and inflammation of the brain, or a morbid erythism of the nervous system, will require enlarged doses to secure their ordinary effects. The same is the case when there is a lack of the due oxygenation or aëration of the blood, as in *asthma*, *croup*, *bronchitis*, *asphyxia*, etc. The venous blood is oppressive to the brain, paralyzing the sensibilities of the nervous system, and thus deadens the susceptibility of the stomach to the influence of emetics. In such cases very powerful emetics are required, and their ordinary dose should be doubled or even quadrupled.

Emetics have also been used in *amaurosis*. If the stomach is disordered, they may be employed with a prospect of some advantage, but in most cases their use will not result in much benefit.

In *epilepsy* emetics are occasionally beneficial, although a contrariety of sentiment obtains relative to their utility in this disease. When the disease arises from a disturbed condition of the digestive organs, evidenced by nausea, flatulence, and other symptoms of indigestion, and in those forms of epilepsy assuming a periodic character, they frequently prove serviceable, and a persevering course of long duration has in some cases prevented a recurrence of the epileptic attack. They should be administered every third or fourth day, and in those forms which assume a regular periodicity a short time before the expected attack. Dr. Smith of New York asserts that they are more effectual in epilepsy and hysteria than any of the ordinary remedies used.

They are often used with great advantage in the different forms of *hysteria*. In the convulsive form of this disease, we have found them more speedy in arresting the convulsions than any other agents we have been in the habit of using. In those cases simulating syncope, emetics will arouse the patient and restore her sensibilities in most cases, as soon as they have produced nausea and full vomiting. In the chronic form of the disease, they are regarded by some of the most eminent physicians as being more effectual in removing the morbid state of the nervous system, upon which this disease is supposed to depend, than any other class of medicinal agents. The shock which they impart to the whole system, but particularly to the nerves, seems to prepare it for the reception of antispasmodics, tonics and alteratives, which agents are found doubly efficient where preceded by, or alternated with, an occasional emetic.

In *spasmodic* and *convulsive* affections they are preëminent. By nauseating and relaxing the system, they often exert a very powerful influence over the spasm; in these cases they are given not only by the mouth, but also used as enemata.

11. *Action in Amenorrhea.*—Wherever amenorrhea arises from a sudden check of the menstrual secretion, in persons of a plethoric habit, by exposure to cold, a spasm or constriction of the extreme uterine vessels is the result; when emetics, accompanied by warm diluents, pediluvia and fomentations, will in many instances speedily remove the constriction and restore the secretion. The nauseating, relaxing, sedative and diaphoretic influences in such cases are very desirable. In other cases, induced by any sudden mental excitement or emotion, or by any of the depressing or exciting passions, such as excessive anger, fear, joy or grief, causing a sudden abstraction of the vital and vascular afflux from the uterus and concentrating it upon the brain, or any other organ, they will not unfrequently be found valuable auxiliaries in equalizing the excitement, and restoring the catamenia.

In *chlorosis* arising from retention of the menses, when there is a languid circulation, with a depraved and variable appetite, emetics, in conjunction with chalybeates and tonics, will be found important in breaking up the chlorotic habit. In many cases it will be found that restorative agents will have but little if any effect, the digestive organs being so obstructed and weakened that those agents which are indispensable to the restoration of the normal quantity and quality of the blood can not be absorbed. In these cases we find more or less nausea, loss of appetite and loaded tongue. In such cases we have seen removed from the stomach by the action of an emetic, such quantities of offensive mucus and vitiated secretion, that we could not be surprised that our iron and tonics had proven ineffectual; in such cases as these the careful administration of an emetic is the first step toward a cure.

In *dysmenorrhea*, repeated emetics, the hip-bath and fomentations, aided by anodynes and antispasmodics, will prove of much advantage in subduing the morbid sensibility of the uterus and removing the spasm. We do not speak of their employment alone, because a combination of influences will be found more effectual than any one class simply.

XII. *Action in Dropsy.*—Emetics are frequently prescribed with great advantage in the various forms of dropsy, but particularly in *ascites* and *anasarca.* Their action promotes the activity of the absorbent system; vascular excitement retards absorption; emetics, therefore, by lessening vascular excitement, and producing depletion, favor this process, and prove of great utility in dropsical cases.

The full advantages of these agents can not be so effectually secured when the patient is permitted to drink freely of diluents during their operation. When given in this manner, the fluid furnishes the material for absorption; consequently the vessels are kept in a state of repletion, and the reabsorption of the exhaled fluid goes on slowly, if at all, and they fail to prove beneficial. When, however, a *dry emetic* is given—that is, an emetic with but a small quantity of fluid—it nauseates longer, proves more decidedly sedative, acts more effectually upon the lungs, kidneys, skin and intestinal exhalants, and thus more effectually depletes, at the same time that it facilitates the process of absorption. A very eminent writer relates a case in which a single emetic so effectually excited the mucous membrane of the stomach as to cause the patient to vomit six pints more than he drank during its operation.

They also act as revulsives, and while increased exhalation is taking place in the alimentary canal, and the other great emunctories of the system are active, the dropsical effusion must be lessened, and occasionally it has been entirely arrested, and a speedy cure has been the result. It is, doubtless, in these various ways that emetics increase the action of the absorbents, and effect the removal of the effused fluids.

XIII. *Action in Glandular Diseases.*—In diseases of the glandular system, such as enlargements of the glands, buboes, scrofulous tumors, hernia humoralis, etc., they not unfrequently disperse them with great rapidity, owing probably to their revolutionizing influence over the absorbent system. They may be used in many of the cachetic habits of body with much advantage. Mild emetics may precede or accompany the use of alteratives and general restoratives, in many of those depraved and vitiated states of the system characterized by cutaneous eruptions, and foul and ill-conditioned ulcers. The influence of alteratives and corroborants seems to be more decidedly sanative when they follow emetics, or when emetics are occasionally prescribed during the course of their administration, than when the important influences of this auxiliary class of agents are omitted.

XIV. *Action in Phthisis Pulmonalis.*—In the early stages of phthisis pulmonalis, gentle emetics are of great importance. They expel the mucus from the bronchial tubes and air-cells of the lungs, lessen the dyspnœa, and act very beneficially as expectorants. They lessen the irritation and congestion in the lungs, and equalize the circulation, diminish arterial excitement, and relieve laborious respiration; and in a short time, if early resorted to, will frequently effect a cure. In some cases we have administered them every morning, or every other morning, in nauseating doses, until they had relaxed the system, and then increased the dose until gentle emesis ensued; and this course, if persevered in for several weeks, aided by demulcent expectorants, and such agents as will improve the quality and quantity of the blood, will be followed by the happiest results. It checks the cough, allays the irritation of the lungs, mitigates the urgent symptoms, and is often of itself attended with an increase of strength. An occasional emetic, throughout the whole course of the disease (if there is not too much debility), will give great temporary relief; in the advanced stages of the disease they are too debilitating, and should rarely be prescribed.

XV. *Action in Diabetes.*—Emetics are found to be very useful in diabetes. In several cases in which we have used them, they seemed to exert a very happy influence. Others speak very favorably of their use, and cases are recorded in which a single emetic has effectually arrested the disease. They equalize the circulation, stimulate the digestive apparatus, promote the secretions of other organs, and probably in this way lessen the burden imposed upon the kidneys, giving them time to recover their tone.

XVI. *Action in Ophthalmia.*—Ophthalmia is another disease in which emetics are found to exert an important influence. Much authority might be adduced in favor of their administration in this affection, when there is a deranged condition of the digestive organs, and acidity of the stomach; which is by no means an unfrequent occurrence, both in the acute and chronic form of the disease. In acute ophthalmia, their depletive, revulsive and sedative influence over the disease is very conspicuous.

XVII. *Action in Dysentery.*—In dysentery they are often resorted to with great advantage. This disease is often connected with, or dependent upon a redundancy of vitiated bile, or other irritating materials accumulated in the primæ viæ. When this is the case, emetics are indispensable; their tendency to equalize the circulation and promote diaphoresis, renders them especially valuable.

XVIII. *Action in Hemorrhage.*—Emetics are occasionally employed in the various forms of hemorrhage. With regard to their use in *hemoptysis*, some discrepancy of opinion exists. When administered in nauseating doses, for some time before emesis is effected, they diminish the momentum of the circulation by their sedative influence, relax the system, and equalize the circulation; and may be occasionally prescribed with safety and advantage. But as a general rule, we conceive that their mechanical influence would be hazardous; the impetus which they give to the pulmonary circulation renders their indiscriminate employment objectionable, and in many cases dangerous. In active hemorrhages they should be used with much caution. If administered in small doses and not often repeated, their equalizing, revulsive and sedative influences counteract any bad effect that might otherwise occur. In passive hemorrhages from the lungs, and in those witnessed in the incipient stages of phthisis pulmonalis, mild emetics are valuable auxiliaries to expectorants and other pectoral agents.

The same objection does not rest against their use in *uterine hemorrhages;* an equal amount of mechanical force is not exerted upon the uterine vessels in emesis; neither, in like cases, is the same impediment presented to interrupt the uterine circulation, as is the case in hemoptysis. Emetics cause contraction of the uterus, and thus the orifices of the bleeding vessels are closed, and many cases are reported in which they have proved efficacious.

Hæmatemesis is often owing to visceral engorgement, or torpidity of some of the abdominal viscera, producing irregular congestions, and hemorrhages. Emetics remove the venous congestions, and by the pressure which they cause to be exerted upon the diseased viscus, the exhaling vessels are compressed, and the hemorrhage is arrested.

There may be many diseases, other than those to which we have referred, in which emetics are proper and highly valuable. In a work of this kind, the principal cases in which they may be used, and their general application to the treatment of disease, can only be alluded to; their specific application must be left to the good sense and sound discrimination of the judicious practitioner.

CONDITIONS CONTRAINDICATING THEIR USE.

1. They are contraindicated in apoplexy, phrenitis, cerebral congestions, in short in all cases where a great determination to the brain exists.

2. They are improper in advanced stages of pregnancy, in hernia, aneurisms of any of the large vessels, hypertrophy of the heart, or ossification of the arteries or valves of the heart; we might say in any disease of the circulatory system.

3. They are improper in all cases of extreme debility, as in the more advanced stages of febrile and inflammatory disease, etc.

4. In *gastro-intestinal* irritation or inflammation, their ordinary use is very improper.

As a general rule emetics are inadmissible in the above cases, but we can lay down no infallible rule for their employment, as circumstances may occur in such relations to the usual contraindications, as to justify their use.

In febrile affections, where there is great excitement, if no danger would result from a delay, emetics should not be administered until the fever abates. If they are prescribed during the exacerbation they do not operate so kindly and effectually as they do during the declination or stage of apyrexia. Not only so, but largely increased doses are required to produce the same effect. During the hight of the fever, every fiber is tense, and the exalted erythism of the nervous and vascular systems lessens the susceptibility to their influence. They should be administered, at first, during the pyrexial stage, in nauseating doses, to relax the system; and this influence should be aided by warm infusions of eupatorium, or chamomile; when there is sufficient relaxation, and perspiration is induced, the dose may be increased, and repeated every twenty or thirty minutes, until the stomach is thoroughly evacuated, and the whole system is brought under their influence.

Another rule pertaining to the administration of emetics (and one not to be rejected as unimportant), is the avoidance of cold drinks during their operation. It is improper for them to be given even when the mildest emetics are prescribed, but especially so during the use of tartrate of antimony. When the stomach is relaxed by the emetic, and large quantities of warm fluids, cold drinks often produce violent (and in some cases fatal) spasms of that organ. The shock is powerful, and its effects not unfrequently irremediable, even when the most potent stimulants and antispasmodics are speedily used. Dr. Eberle notices two cases of sudden death caused by drinking cold water, soon after taking a dose of *tartar emetic.*

Another rule, never to be violated, is the use of simple, digestible and unirritating diet for twenty-four hours after an emetic. Emetics produce a temporary relaxation of the muscular fiber of the stomach, and lessen its digestive powers; hence the necessity for time to enable it to recover from this enervation, before being taxed with the elaboration of even a small portion of most of the ordinary indigestible articles of diet in daily use.

RECAPITULATION.

1st. Emetics serve to expel any morbid or vitiated matter, whether undigested food, secretion, or poison from the stomach.

2d. They serve to promote general relaxation, equalize and lessen the momentum of the circulation, counteract congestion, excite the liver and other glands to action, promote diaphoresis, and act as depletives, deobstruents, and eliminatives.

3d. The shock which they impart to the nervous system is often productive of much good in the early stages of fever, and likewise in many chronic diseases, arresting the disordered action by supersession.

4th. Emetics are often productive of much good in spasmodic or convulsive action, being by virtue of their action on the brain and nervous system, powerfully antispasmodic.

5th. In many chronic affections of the chylopoiëtic viscera, and glandular system, they prove beneficial by newly exciting those organs, promoting absorption and the various secretions and excretions—thereby subverting morbid action.

6th. They promote the bronchial secretion, and facilitate expectoration, and therefore are of great importance in diseases of the respiratory organs, such as croup, asthma, pertussis, bronchitis, pneumonia, etc.

7th. From their supersedent, sedative, depletive, revulsive, relaxing, deobstruent, depurative and equalizing effects, they often exert a revolutionizing influence upon the entire system, thereby breaking up perverted associations, and in many instances completely subverting existing morbid sympathies, and effecting permanent cures.

In these various ways they serve as valuable auxiliaries to the use of tonics, alteratives, etc., co-operating with, and materially facilitating their curative action.

CLASS II.

CATHARTICS.

CATHARTICS are those agents which, by increasing the peristaltic action of the bowels, cause alvine evacuations. They embrace a very extensive class of remedial agents, and one, too, which is probably in greater use than all others taken together. In relation to the extensive, and we might say almost unlimited use, as well as paramount importance of this class, they are deservedly the most popular class of remedial agents in the materia medica. No disease afflicts frail mortality in which either the milder or more active agents are not found to be either highly important curative or palliative means during most periods of its continuance.

Their employment is by no means confined to the practitioner of medicine; on the contrary, they are resorted to in domestic practice, in some of the infinite varieties of pills in common use, powders, salts, sulphur, magnesia, extracts, bitters, infusions, sirups, decoctions, etc., etc., either as active cathartics or as laxatives, more frequently, we presume, than all other remedial agents. They have been introduced into such general use from the fact that they are easy of administration, and so readily suggest themselves to the minds of the ignorant, and that their employment is so rarely followed by any immediate injurious consequences. They afford temporary relief in so many diseases, that they are considered as an universal panacea for every ailment. Every variety of cathartic agents have been employed in manufacturing cathartic pills, and colossal fortunes have been made by their preparation and sale. It may be said that the Americans are a drug-taking people—"*pills*" being considered by a majority almost as essential to well-being as bread, and more so than water applied externally, exercise, fresh air, etc. That great injury results from this indiscriminate use of cathartics is obvious, and it should be the duty of every conscientious physician to instruct the public mind on these and other subjects appertaining to health.

When used, however, with a definite object in view, and with a correct knowledge of the pathology of the disease for which they are given, no class of agents are of greater importance.

Action of Cathartics.—Cathartics may exert their influence in three different ways: 1st. By their irritant effect upon the intestinal tube; 2d. By absorption they are conveyed into the blood, and having a special affinity for the intestinal canal, they are excreted through it, and stimulate it to increased action; 3d. By causing an endosmosis from the capillaries to the alimentary canal, causing distention, irritation and evacuation.

Irritant cathartics are those agents which, being insoluble, are not absorbed after being taken into the stomach. They produce a topical irritation of the mucous membrane of the intestinal tube; this irritation is extended to the muscular coat (either directly or through the reflex action of the nerves), and the peristaltic action is quickened, their propulsive power is increased, and defecation accomplished. This action may in some cases only remove the contents of the bowels; but in others the stimulation is extended to the glands of the intestines, and they prove eliminative. They may also cause an endosmosis of the blood-serum, and prove hydragogue.

Specific cathartics are those agents which will produce catharsis, whether introduced into the stomach, thrown into the serous cavities, injected into the veins, or absorbed through the skin. They are soluble in the fluids of the alimentary canal, and hence are absorbed and act from the blood; having a special affinity for this portion of the system, they pass to it, and are excreted by the intestines. Why these agents have an affinity for the intestines, it is useless for us to speculate; we know the fact that certain agents pass to the bowels, others to the kidneys, to the skin, and other organs, and are excreted by them, but the cause of this will always remain a mystery.

This class of cathartics are always eliminative, stimulating the part through which they are excreted to increased action. What is the value of this *elimination?* It has been shown by Mekel that the mucous surface of the intestinal canal consists of about 1400 square inches, covered with a closely packed glandular apparatus; and from this large surface secretion and excretion is constantly going on. Of the function of these numerous glands, but little is positively known, yet it has been clearly proved by physiologists that the larger part of the feces is excreted from the blood through some part of it; that instead of this excretion being composed of undigested food, it is formed of the nitrogenized tissues of the body, which being worn out, are eliminated from the system in this manner. The advantage to be derived from this class of cathartics is, then, very apparent: they stimulate this immense glandular apparatus to increased action, and eliminate from the blood the products of disintegration and decay; they may also act as depletives, if this action is maintained, lessening the quantity of the blood.

The cathartic salts are supposed by many eminent authors to act by causing an endosmosis from the blood (the lighter fluid) to the solution (the heavier fluid), and by thus increasing the contents of the intestines their natural action is called into play, and their contents are excreted. It is also maintained that when the solution contains less than five per cent. of the salt it does not prove purgative, but diuretic, and is excreted by the kidneys. We do not feel willing to admit the entire physical action of this class of agents, and we think that a little consideration will convince any one that this is not a faithful description of their operation. For instance, an ounce of some purgative salt is placed in the stomach in a saturated solution; it will first cause an endosmosis of the blood-serum to the salt, but as the dense fluid has an affinity for the membrane, and passes to it, the part next the membrane becomes diluted, and is absorbed by the blood; we have thus an exosmose of the blood-serum to the salt, and an endosmosis of the solution to the vessels. Some portion, then, of the purgative agent is absorbed, and as the solution passes through the length of the intestinal canal, we might reasonably suppose that a considerable portion of it would be absorbed. This, then, acts specifically from the blood, and might be the cause of the purgative action, but most probably acts in conjunction with a portion which remains in the bowels.

This class of agents may be divided with much propriety into *laxatives* or *aperients*, and *cathartics* proper, according to their mildness or efficient mode of action.

Laxatives are but a subdivision of cathartics, and embrace agents which act but feebly or very gently upon the bowels, simply evacuating their contents without materially increasing any of the secretions. Among this class of agents we may name the manna, rhubarb, castor-oil, sweet-oil, sulphur, magnesia, etc.

Cathartics are those agents which act briskly and efficiently upon the bowels, not only evacuating their contents, but causing an increased secretion from them. Their influence extends to surrounding parts; they arouse the neighboring glands to increased action, stimulate the intestinal exhalants to increased secretion, and produce a very decided impression upon the general system. To this division of cathartics belong the podophyllum, jalap, iris versicolor, gamboge, croton oil, elaterium, etc.

This division is again subdivided according to the different effects which specific articles produce upon the system, and hence the terms *purgative*, *drastic*, *hydragogue* and *cholagogue*.

By *purgatives* is meant the mildest of the cathartics, as senna, castor-oil, rhubarb, etc.; the two last being purgative as well as laxative, if administered in suitable doses.

Drastics are those cathartics which are exceedingly harsh in their action, operating violently, and not unfrequently producing nausea, vomiting, tormina and tenesmus, and even gastro-enteric inflammation. Gamboge, scammony, podophyllin, and most of the resinous cathartics, are examples of this division.

Hydragogues are such cathartics as greatly augment the exhalation of fluid into the intestinal canal, and cause copious liquid evacuations. Jalap, elaterium, and some purgative salts belong to this division.

Cholagogues are such as exert a specific action on the liver, by removing obstructions and arousing it to action, thus causing copious bilious discharges. Podophyllum, podophyllin its active principle, and colocynth, are examples of this class.

These subdivisions are quite arbitrary, and might with much propriety be rejected; for the same article often possesses two or more of these particular properties, as the gamboge, colocynth, etc.

The same article often acts very differently on the same person at different times. At one time a particular agent may act as a mild *purgative*, and at another it may operate as a powerful and even *drastic* cathartic; depending upon the acute or diminished sensibility of the nervous system, or morbid irritability of the bowels.

Cathartics are also said to be *refrigerant*, when they greatly lessen the heat of the body, as the sulphate of soda, sulphate of magnesia, and supertartrate of potassa.

Those which determine the vascular afflux to the pelvic viscera, and act either directly or indirectly upon the uterus, promoting the menstrual secretion, are called *emmenagogue* cathartics. The aloes, black hellebore, etc., are examples of this class.

Cathartics vary much in regard to the part of the intestinal tube upon which they tend to act. Some act mostly upon the stomach and upper intestines, producing nausea, and not unfrequently bilious vomiting, or as *emeto-cathartics*. This effect arises from their influence being mostly exerted upon the superior part of the alimentary canal, as is the case with the podophyllum, gamboge, colocynth, etc. Others exert their principal influence upon the lower portion of this canal—the colon and rectum—as the aloes; while others act upon each and every portion of the intestinal tube, as the jalap, elaterium, colchicum, etc.

The reason why different cathartics seek out and act upon different portions of the intestinal canal, is involved in much obscurity. Some have attempted to account for it on the ground of the difference in solubility of the different agents; those most soluble being supposed to act most readily, and consequently upon the upper part of the canal; while those of difficult solubility act principally upon the lower portion of the canal, because they pass the upper portion without absorption. These explanations are by no means satisfactory; for the cathartic principle of the aloes is very soluble, and yet it acts upon the colon and rectum. It will likewise, as will other *specific* cathartics, affect the same portions of the intestinal tube, when absorbed from a serous cavity, from the skin, or when injected into the veins. We can only account for these different effects in the same manner that we account for the action of a specific cathartic. They have a special affinity for certain portions of the mucous membrane or glands, and are excreted by this part, thus stimulating it to increased action.

From what has already been said relative to the modus operandi of the different varieties of cathartics, it will readily be seen that the proper selection and adaptation of certain ones to the multiplied and ever-varying forms of diseases, is a matter of the first importance to the practitioner of medicine. Thus, if the patient be of a plethoric habit, if a high grade of febrile or inflammatory excitement exists, if the bowels are torpid, or there is an undue determination to the brain, or a dropsical effusion exists, a very different class of cathartics will be indicated, from those required where there is great exhaustion, as in the advanced stages of fever, in chronic diseases attended with great debility, in diarrhea and dysentery, and especially in cases of irritation or gastro-enteric inflammation.

THERAPEUTIC INDICATIONS.

In treating of the therapeutic application of cathartics, we shall speak of the different states of the system to which particular ones are adapted, and at the same time advert to the valid objections resting against others in the same or similar cases. As when describing emetics, we shall notice a few of the particular diseases in which cathartics are employed with advantage.

1. *Atony or Torpor of the Bowels.*—In cases of torpor and inactivity of the bowels these agents are of primary importance. In this condition digestion is imperfectly performed, and frequently food is retained in an imperfectly digested condition much longer than the laws of health will tolerate,

while retained it is mingled with the various products of secretion eliminated from the blood through the walls of the canal. This heterogeneous mass becomes more acrid and irritating, and we may add, disease-creating, in proportion to the time it is retained in the bowels. The more liquid portions are reäbsorbed into the blood, contaminating that fluid, causing sick-headache, pain in the back and limbs, fever, loss of appetite, etc. We may have the same results produced by the non-elimination of effete matters from the blood, owing to the torpid condition of the bowels; and in either case, if this condition continues, it may be the cause of many of the acute diseases; it also aggravates the symptoms in many chronic affections.

Thus, in this condition of the bowels, cathartics mitigate the symptoms in many inveterate chronic diseases; and in the milder acute diseases, such as colds, headache, jaundice, foul-stomach, slight attacks of a febrile and inflammatory character, they are often found entirely adequate to the relief of the patient without any, or with but very little other medicine.

II. *Action in Fevers.*—Too much importance can not be attached to the judicious use of cathartics in every variety, of either idiopathic or symptomatic fever. Thus in *intermittent, bilious remittent, continued, typhus, typhoid,* and in every variety of the *exanthemata,* as *measles, scarlatina, variola,* etc., either cathartics or laxatives are of great utility, and we might say almost indispensable.

In febrile and inflammatory diseases the bowels are usually constipated, and a continual accumulation is taking place in them. The great extent of surface, and the innumerable number of glands that are continually pouring out large quantities of excrementitious matter into it, renders it the common sewer of the system, the great receptacle into which most of those materials which have been worn out, or degenerated in the body are thrown. It is as one writer not inaptly remarks, "The great storehouse of disease;" in it all the redundant portions of our food are lodged, and into it most of the decayed particles of our organs, after they can no longer prove subservient to the purposes of the animal economy,—but if retained must necessarily act as foreign and disease-creating agents,—are thrown by the action of the intestinal exhalants.

While this vitiated mass is retained in the bowels, the fluid parts of it are constantly absorbed and conveyed back into the circulation, where it adds fuel to the excitement already existing. It not only vitiates the blood by its own presence, but by increasing the chemical changes that are taking place in that fluid, it thus predisposes to febrile and inflammatory diseases and often produces them. Cathartics very effectually counteract these morbid conditions by thoroughly evacuating the bowels.

An active cathartic is said to reduce the amount of circulating fluid from one to three pounds; in this way they act as powerful depletives. They serve to depress the vascular and nervous excitement, and moderate the intensity of febrile and inflammatory disease. These effects seem to arise in part from throwing off the vitiated accumulations in the bowels, and thus removing a source of irritation; and in part from stimulating the intestinal exhalants, and thus causing an abstraction of large quantities of serum; in this way they act as depletives and indirectly as sedatives.

Inasmuch as we are opposed to depletion by the lancet in the class of diseases termed sthenic, it may be said, If cathartics are such powerful depletives and carry off such large quantities of serum, they are quite as debilitating and therefore as objectionable agents as the lancet. The comparative physiological importance of the two constituents of the blood, viz.: the crassamentum and serum, readily unmasks the error, and enables us to answer the question satisfactorily. While the crassamentum or solids of the blood furnish all the materials for nutrition and secretion, supplying the waste of the body, stimulating the entire system to normal action, it is evident that the removal of any portion of it would produce a lasting and pernicious influence upon the system. On the contrary the serum serves rather as a medium or vehicle to transmit the crassamentum through the system to supply its wants, and is therefore comparatively unimportant. Not only so, but if largely diminished it may be speedily replenished by the free use of diluents. But this is not the case with the fibrine, albumen, and red corpuscles of the blood, highly elaborated and vitalized parts; if they are abstracted they are restored only by a very slow, vital process.

In depletion by the lancet, the entire blood is removed, both solid and fluid; by cathartics, the watery portions only are abstracted. In the one case the great restorative principle has been needlessly removed; in the other, an aqueous and less essential part, one which furnishes none of the materials of nutrition or reparation. The speedy recovery which follows from the loss of the serum, and the tardy recovery supervening upon the loss of the albumen, fibrine, and globules, fully sustains us in the position we have taken. In one case, a few hours, or at most a few days are sufficient to restore the lost energies of the system; while in the other as many weeks, or even months may be required to accomplish the same desirable object.

If there is torpor, or congestion of the liver, and consequently congestion of the spleen and the entire portal system of veins, we have a class of cathartics that act directly upon this viscus. Almost any cathartic, however, will act indirectly upon the liver; this they do by causing an irritation of the duodenum, which is conveyed to the liver; and increased action is generally the result. Cholagogues are supposed to act directly upon this organ; thus podophyllin, leptandrin, etc., we suppose have a special affinity for it, and are probably partially excreted by it.

Cathartics exert a very powerful influence over the secretions of the glandular system, and also over the various secreting surfaces. In short, they act as depletives, and indirectly as sedatives; while at the same time they increase, and often effectually and speedily restore all the secretions.

Another important influence exerted by cathartics is their revulsive effects. In cases of inflammation, congestion, or any undue excitement in the brain, the strong impression which an active cathartic makes upon the bowels, renders them powerfully derivative, as well as depletive agents; and hence they often afford prompt relief. In such cases an active hydragogue cathartic should be prescribed.

In cases of congestion of any of the abdominal, or thoracic viscera, occurring during the progress of febrile disease, their influence is transmitted from the bowels to the neighboring organs, by contiguous sympathy, and relief obtained. They act as revulsives, and as direct topical depletives.

If the nervous system is oppressed, or overpowered by the presence of vitiated material in the blood, or by any morbid accumulation in the bowels, or by congestion of any organ; or if the vascular and nervous energies are concentrated upon any particular part, cathartics are exceedingly valuable in removing the oppression, and equalizing nervous and vascular excitement.

In the treatment of febrile and inflammatory diseases, the constitution and habit of the patient, or state of the system at the time, will enable the judicious physician to select the proper cathartic to meet the indications that may be present. In an attack of bilious remittent, or a synochal grade of continued fever, if the constitution is vigorous, and the patient plethoric, very active and powerful hydragogue cathartics, if administered early, will be found most effectual in arresting the progress of the disease. An emeto-cathartic will fulfill more indications than those of an opposite character; they do this by acting more efficiently on the various secretory organs, and by the shock which they impart to the nervous system. They often break the chain of morbid associations, and arrest the disease when milder agents would fail.

In the early stages of fevers, active cathartics may be repeated every second or third day, if required; but as the disease advances less active agents, as the mild purgatives, and if there is much prostration, laxatives, will be found the most appropriate evacuants.

If the constitution of the patient is naturally feeble, or has become enfeebled by a protracted disease, or gastro-intestinal inflammation exists, the active, drastic hydragogue, or cholagogue cathartics would be inadmissible; none but aperients, or the milder purgatives should then be administered.

It may be proper to state, that this class of agents were at one time regarded as objectionable in the treatment of typhus and typhoid fevers, from the debility which they were supposed to produce, in addition to that already existing. Experience, however, has long since decided in favor of their employment in these diseases. Dr. Hamilton, in his remarks on their use in typhus fever, says: They cleanse the tongue, mitigate thirst, restlessness and heat, by removing vitiated matters from the intestines, which would morbidly impress the nerves, and produce debility if retained. They render recovery more certain and speedy, and instead of debilitating, actually increase the strength. The new excitement in the nervous system weakens the train of morbid sympathies, and hastens convalescence, independent of their evacuant effect.

In the early stage of yellow fever, cholagogue cathartics are employed with advantage; in the advanced stages, mild laxatives only should be used.

In the exanthematous fevers, as variola, rubeola, scarlatina, etc., active cathartics can not be employed without great danger of increasing the severity and danger of the disease. If they are employed during the stage of eruption they determine the circulation to the intestines; and if they do not produce a retrocession of the disease, they produce a similar eruption on the mucous membrane to that which exists in the skin. In the early stages, however, the bowels should be evacuated; but this should be accomplished by using such agents as produce the least irritation. After this the bowels should be kept in a soluble condition by the use of the mildest laxatives. These diseases are self-limited, and by no mode of medication that we can adopt can we expect to arrest their progress. They run a specific course, and by the administration of medicines our sole object should be to moderate the intensity of the symptoms, prevent congestions, retrocessions, etc., and not with a view of cutting short its course, as is our aim in other varieties of fever.

III. *Action in Dropsy.*—Cathartics are by no means an un important class of remedial agents in hydropic affections. Perhaps there is no class of therapeutic agents which so effectually arouse the absorbent system as the one under consideration. We think we hazard nothing when we say they occupy the front rank in the treatment of these complaints. If it is said that diuretics should have the preference, we must determine this question by referring to the salutary effects following the independent administration of each. Their relative importance can be ascertained by administering them separately, and comparing the effects resulting from the use of each respectively. The utility of diuretics in dropsy is greatly increased by being preceded by the use of proper cathartics. Cathartics stimulate the secretions of the entire alimentary canal; they remove congestions, determine the circulation to the large mucous surface of the intestinal tube, and cause an endosmosis from the capillaries to the intestines, by which it is removed from the body. This irritation and determination of the blood to the bowels gives increased motion to the circulation, and by the removal of large quantities of fluid from the vessels, the mass of the circulating fluids is decreased. As soon as there exists a depletion of the sanguiferous system, there is an immediate absorption by the veins, to restore the lacking fluid; this absorption, if there is not large quantities of fluid ingested, will be taken from the dropsical effusion. A sluggish circulation of the blood always predisposes to dropsy, and without the circulation is stimulated, absorption does not take place. Here we have a marked difference between the two classes of agents: diuretics will remove the watery parts of the circulating fluid, but they do not stimulate the circulation, and consequent absorption; while cathartics not only remove the fluid, but stimulate the circulation and produce rapid absorption. After cathartics have produced the effects just referred to, diuretics will exert their full influence in removing the fluid.

The most useful cathartics in these diseases are such as not only produce watery discharges, but stimulate or irritate the intestinal surface. These agents are termed *hydragogues*, from producing large fluid discharges. These, with the exception of the purgative salts, are all acrids. When the purgative salts are employed for their hydragogue properties, they are generally combined with some irritant cathartic, as jalap, colocynth, etc. Elaterium may be referred to as the type of hydragogue cathartics.

Dropsy is a morbid serous effusion, or accumulation of serum in any of the cavities of the body, or in the cellular tissues—following as the sequel of many chronic diseases, particularly those of the kidneys, and not unfrequently from a subinflammatory action of some of the serous membranes.

It is in many cases dependent either upon local or general debility.

It seems to be a physiological law that the relative proportions between the solids and fluids, and also between the different constituents of the fluids, should be maintained. If blood be abstracted by the lancet, or by hemorrhage, or if the serous portion alone be removed by the action of a cathartic, or by any other cause, increased absorption from internal cavities immediately follows, to replenish the loss, and restore the equilibrium. If no dropsical effusion exists, and fluids be taken into the stomach, or injected into any of the cavities, they are rapidly absorbed to supply the place of that removed, and to maintain the relative proportions between the different constituents of the blood. It may be proper to state that, in cases of ascites, for instance, where the effusion is great, causing a deficiency of serum in the blood, this deficiency is counterbalanced by the diminished action of the kidneys and cutaneous exhalants.

Pathological observation and direct experiment both confirm the position that absorption is tardy when there is vascular repletion; and that it is accelerated in proportion to the extent to which depletion is carried.

Cathartics stimulate the intestinal mucous exhalants, and cause them to pour into the bowels large quantities of serum, and consequently a deficiency of fluid must exist in the bloodvessels. The constant efforts of the system to maintain the due amount of serum in the blood by absorption, and the increased activity of this process, in proportion to the reduction of the serous fluid, enables us to explain satisfactorily the modus operandi of cathartics in dropsies. They destroy the balance existing between the different constituents of the blood, by removing the serum, and at the same time greatly diminish the amount in circulation; and in proportion to these effects will be the activity of absorption of effused serum from the cavities in which it is deposited. The serum, after being reäbsorbed, often stimulates the kidneys to increased activity, and in this way they act indirectly as diuretics. Cathartics, if given in conjunction with diuretics, often greatly increase their diuretic powers; absorption continues more active for several days after the action of the cathartic has ceased—increased diuresis being the result.

The derivative power of cathartics also renders them important agents in diminishing dropsical effusions. The part from which effusion takes place necessarily becomes the center of fluxion; but by the action of a cathartic upon the bowels, the point of fluxion is changed; at least a new, though temporary one is established. The action of a cathartic upon the intestinal exhalants exerts a powerful derivative influence, and while the bowels are the seat of derivation as well as exhalation, the dropsical effusion and local determination must necessarily be reduced; the materials to supply exhalation and the morbid action being diverted from the point of original excitement. In this way, an opportunity is afforded for the enfeebled organ or part to recover its tone, and for its functions to become improved. In all cases a fixed irritation or point of excitement is attended with accompanying loss of action in other parts of the system—abnormal or redundant secretion of one organ or tissue is accompanied with a diminution of the secretory action of other organs; or if one organ becomes diseased, and its normal secretion is arrested or reduced in quantity, it is compensated by the vicarious action or corresponding activity of some other organ, to supply its place.

IV. *Action in Diseases of the Brain.*—In all cases attended with an undue determination to the brain, as in apoplexy, phrenitis, cerebral congestions, etc., they are preëminently important. In these cases, the most powerful drastic hydragogue cathartics should be employed, if no symptoms are present to contraïndicate their use.

Their salutary effects are dependent upon their depletive and revulsive powers. In most cases of oppression of the brain arising from a congestion of the cerebral vessels, large quantities of the most active class of cathartics will often be required to produce even moderate purgation. The nervous sensibilities are so deadened that all medicines fail to produce their ordinary effects upon the patient; hence the necessity of administering cathartics without regard to their usual doses; the only criterion to determine the quantity to be used, being the results which follow from their employment.

The same remarks apply in cases where the narcotic poisons have been taken in over-doses. Derivation and depletion are the most important indications fulfilled by the employment of cathartics in these diseases.

V. *Action in Diseases of the Liver.*—In chronic hepatic diseases their importance is fully established. When the liver is torpid, or when it fails to furnish the proper quantity of the biliary secretion, or when there is jaundice, or congestion of the portal veins, and consequently of the abdominal viscera (all of which are of frequent occurrence), cathartics are of unquestionable utility. For restoring the biliary secretion, and removing the hepatic and portal congestion, the materia medica furnishes no agents equal to *cholagogue* cathartics. They act directly upon this organ, in addition to their cathartic effect, stimulate its secretion, and thus facilitate the passage of the portal blood through it. Their derivative action on the mucous membrane of the bowels, likewise assists to increase this secretion, by causing a determination of blood to this part; they increase the quantity which has to pass through the liver, and thus indirectly cause a determination to the liver.

The beneficial action of those agents which, while they act directly upon the liver, do not produce any irritation of the bowels, is very marked in many diseases. Thus, in chronic inflammation of the stomach, small intestines, etc., accompanied by torpor of the liver, such an agent as the leptandra virginica or leptandrin, which will stimulate the liver to increased action, increase the flow of blood through it, and thus remove the venous congestion of the inflamed organs, without increasing the inflammation by direct irritation, can not but be considered as meeting most of the indications to be fulfilled. As an example of such a condition, we may refer to the diarrhea or cholera-infantum of children: in this disease we have a low form of inflammation of the small intestines, which in nearly every instance is accompanied by hepatic torpor. The agents just referred to remove this torpor without irritating the bowels, and by thus removing the congestion, a cure often results. This same class of agents prove very beneficial in hemorrhoids for the same reason: they increase the flow of blood through the portal veins, and

nd emmenagogue cathartics are proper. In this state of
system there is evident inactivity of the uterine vessels,
ucing the want of a due concentration of the vital and
ular afflux to the pelvic viscera; such agents, therefore,
he aloes, black hellebore, etc., by causing a determination
the pelvis will prove the most efficient. It must be
embered, however, that the system is in such a condition
it can not bear depletion, and therefore these agents
t be combined with chalybeates, tonics and stimulants,
itious food and exercise.

n the contrary if a sudden suppression arises from cold,
n an attack of some other disease, or from sudden and
ng mental emotions, as grief, fear, anger, etc., in a
ent of a plethoric habit and a vigorous constitution,
n some of the hydragogue and refrigerant cathartics
uld be employed, aided by nauseating diaphoretics, per-
s emetics, warm fomentations to the pubic region, hip-
hs, etc. In such cases depletion and relaxation are indi-
ed. The object is to subdue exalted organic action, and
nove the spasm of the extreme uterine vessels, when the
est is dependent upon cold and torpor of these vessels;
d when it results from some strong mental impression, the
ject is to restore the vascular and nervous afflux to the
erine system from which it has been withdrawn.

VIII. *Action in Dysentery.*—Cathartics are important ther-
eutic agents in the treatment of dysentery. Generally,
e upper portion of the alimentary canal is in an obstinate
ate of constipation, while some portion of the large intes-
nes is in a state of high inflammatory excitement. The
orbid secretions mingled with the imperfectly digested
iment, constitute a vitiated and highly irritating mass,
hich if retained in the bowels would augment the intensity
f the disease. There is, likewise, in a majority of cases,
orpor of the liver, and consequently congestion of the portal
eins; the veins of the lower bowel being the most depend-
nt of these, we have a constant venous congestion at the
eat of the inflammation. The bowels become tumid and
ainful, and a high grade of arterial excitement follows. To
move this vitiated accumulation, stimulate the liver to
tion, and thus remove the venous congestion, and moderate

thus the congestion of the hemorrhoidal, which is the lowest part of the portal circulation, is removed.

In acute or chronic inflammation of the liver, cathartics that produce an irritation of the bowels are contraïndicated. They prove injurious by causing an increased determination of blood to the mucous membrane of the bowels, which blood has no means of returning into the general circulation but by passing through the liver in the portal veins; the action of such a cathartic then, is to cause a venous congestion of the liver, thus directly increasing the disease. Instead of such cathartics, those only which exert a very mild action should be employed—the purgative salts with some slightly stimulating, vegetable agent, being the most useful. Such a combination evacuates the bowels without producing irritation, and at the same time causes an endosmosis of the blood-serum to the canal; and thus proves directly depletive to the liver, by removing that which would otherwise pass through it.

VI. *Action in Chronic Disease.*—In chronic diseases, as in marasmus, scorbutic affections, scrofulous and cancerous habits, herpetic disorders, in all the various forms of inveterate and protracted cutaneous diseases, in obstinate and ill-conditioned ulcers, syphilitic and mercurial cachexy, in short in all the varied forms of disease manifested by a vitiated or depraved condition of either fluids or solids, cathartics are valuable auxiliary medicines. They act as depuratives, cleansing the stomach and bowels of any morbid materials lodged or generated in them, they excite the glands to increased action and thus eliminate morbid material from the circulating fluid. They are thus important depuratives, and with propriety might be called alteratives—at all events they prepare the way and act as auxiliaries to the proper alterative agents.

VII. *Action in Amenorrhea.*—This is another disease in which cathartics may be prescribed with advantage. Emmenagogue cathartics are preferable in some cases, while in others, the refrigerant, deobstruent and hydragogue classes are those to which experience points as being best calculated to fulfill the desired indications. If the patient becomes languid or phlegmatic, and a chlorotic state supervenes, tonic and emmenagogue cathartics are proper. In this state of the system there is evident inactivity of the uterine vessels, evincing the want of a due concentration of the vital and vascular afflux to the pelvic viscera; such agents, therefore, as the aloes, black hellebore, etc., by causing a determination to the pelvis will prove the most efficient. It must be remembered, however, that the system is in such a condition that it can not bear depletion, and therefore these agents must be combined with chalybeates, tonics and stimulants, nutritious food and exercise.

On the contrary if a sudden suppression arises from cold, from an attack of some other disease, or from sudden and strong mental emotions, as grief, fear, anger, etc., in a patient of a plethoric habit and a vigorous constitution, then some of the hydragogue and refrigerant cathartics should be employed, aided by nauseating diaphoretics, perhaps emetics, warm fomentations to the pubic region, hip-baths, etc. In such cases depletion and relaxation are indicated. The object is to subdue exalted organic action, and remove the spasm of the extreme uterine vessels, when the arrest is dependent upon cold and torpor of these vessels; and when it results from some strong mental impression, the object is to restore the vascular and nervous afflux to the uterine system from which it has been withdrawn.

VIII. *Action in Dysentery.*—Cathartics are important therapeutic agents in the treatment of dysentery. Generally, the upper portion of the alimentary canal is in an obstinate state of constipation, while some portion of the large intestines is in a state of high inflammatory excitement. The morbid secretions mingled with the imperfectly digested aliment, constitute a vitiated and highly irritating mass, which if retained in the bowels would augment the intensity of the disease. There is, likewise, in a majority of cases, torpor of the liver, and consequently congestion of the portal veins; the veins of the lower bowel being the most dependent of these, we have a constant venous congestion at the seat of the inflammation. The bowels become tumid and painful, and a high grade of arterial excitement follows. To remove this vitiated accumulation, stimulate the liver to action, and thus remove the venous congestion, and moderate vascular excitement, we have no substitutes for cathartics. Violent dysenteric tenesmus is likewise often speedily relieved by their action. They make a new impression upon the bowels, which is substituted for the original and morbid one.

In the early stages of dysentery, active, but not drastic cathartics are indicated — such as act principally upon the upper portion of the intestinal canal, and specifically on the liver. Subsequently the milder ones, or the proper laxatives—as rhubarb, magnesia, castor-oil, etc.—should be substituted.

IX. *Action in Puerperal Fever.* — In puerperal peritonitis active and even powerful purgatives are of immense importance. If administered early they not unfrequently arrest the disease with the aid of but very little other medicine. The evacuant, and consequently the depletive and sedative powers of refrigerant hydragogue cathartics, in lessening vascular excitement, and reducing the inflammatory action attendant upon this disease, render them one of the most, if not the most important class of medicinal agents.

X. *Action in Rheumatism and Gout.*—Arthritic and rheumatic affections demand the use of this class of agents — at least they are valuable auxiliaries to other remedies. Gout is generally connected with torpor of the liver and portal circle, together with functional derangement of the digestive organs; consequently suitable cathartics are of much utility in that affection. In arthritic and rheumatic complaints, the antiphlogistic power of cathartics tends much to the reduction of the inflammation. Their revulsive as well as cathartic and depletive properties, may aid in satisfactorily explaining their modus operandi in these affections.

XI. *Action in Pneumonia.* — In pneumonia, during the early stages of the disease, cathartics are a valuable class of auxiliary medicinal agents in reducing the inflammation. In the advanced stages of pulmonic inflammation, after free expectoration is established, there is strong objection to active purging, from its debilitating effects. In the early stages of the disease, they prove advantageous, principally from their derivative effect, and from lessening the amount of the circulating fluids. The irritation which they produce causes an increased flow of blood to the mucous membrane of the bowel, and hence the lungs are more or less relieved. As the disease progresses, however, nothing but the mildest purgatives should be employed, and these only to keep the bowels in a soluble condition; and when given they should always be combined with a sufficient stimulant, to counteract their debilitating effects.

XII. *Action in Hypochondriasis.*—In this disordered condition of the system, cathartics which act freely, without causing irritation of the bowels, have been found useful. In these diseases there seems to be a disordered state of the nervous system, arising probably, in most cases, from a dyspeptic and depraved condition of the stomach, functional derangement of the liver and torpor of the portal circulation, a costive state of the bowels, and disordered functional condition of the entire chylopoiëtic system. All of these symptoms will frequently yield to a persevering course of cathartics. Much advantage may be derived by combining them with antispasmodics—particularly with the fetid gums.

There are numerous other diseases in which cathartics prove very advantageous; but having pointed out, and as we trust, clearly illustrated the most prominent therapeutic indications which they fulfill in arresting disease, we shall leave the practitioner to apply them, as his judgment may direct, in the many various conditions of the system in which they may be indicated—but recollecting that as they are powerful agents for good when rightly applied, they produce much injury when improperly used.

RECAPITULATION.

The importance of this class of agents, and the great length of this chapter, may render a synopsis of the indications which they are supposed to fulfill, not only interesting to the student, but highly instructive.

1st. They remove the vitiated accumulations in the primæ viæ, and thus free the system from a frequent source of irritation and fever.

2d. They stimulate the glands of the bowels to increased action, and thus cause the elimination of morbid material from the blood.

3d. Some of them, termed cholagogues, act specifically upon the liver, stimulating it to increased action; they thus increase the secretion of bile, and by permitting the free flow of blood through this organ, remove congestion of the portal system of veins.

4th. They reduce the quantity of the circulating fluids; acting as depletives they reduce the momentum of the circulation. If there is congestion or inflammation of any of the abdominal viscera, they act as topical or local depletives. For these reasons they are of great importance in febrile and inflammatory diseases.

5th. They act as revulsives. Hence their great value in apoplexy, phrenitis, cerebral congestions, and thoracic and abdominal engorgements.

6th. They promote absorption: first, they lessen vascular repletion, and absorption is active in proportion to the reduction of the circulating fluids; second, they remove the serous portion of the blood exclusively, and thus destroy the balance between the different constituents of the blood. The laws of physiology require the maintenance of each of its constituents in due proportion, and for this reason the activity of the absorbents is increased, to restore the lost balance between the constituents of this fluid, as well as between it and the solids.

7th. They equalize the circulation, and thereby counteract local congestion and inflammation.

8th. They are deobstruent and depurative, tending to remove any obstructions in the glandular or lymphatic systems, and promote all the secretions.

9th. They promote nutrition by a direct, and also a sympathetic action, which they exert upon the entire digestive apparatus; they cleanse, energize, newly impress and restore its functions.

10th. In diseases of a general character, either acute or chronic, they newly impress the nerves, arrest existing morbid impressions, break up abnormal sympathies between different organs of the body, or so weaken them as to greatly assist the action of other remedies.

CLASS III.

DIAPHORETICS.

DIAPHORETICS are a class of remedial agents which augment cutaneous transudation; if they produce copious perspiration, they are called *sudorifics;* if they but increase the insensible transpiration, they are called *diaphoretics;* the action of the two classes are the same, the degree of influence upon the cutaneous exhalants constituting the only difference.

The function of cutaneous transpiration is one of great importance to the welfare of the animal economy, so much so, indeed, that when it has been entirely arrested death ensues.

To appreciate the importance of this secretion, we have only to consider the extent of the excretory apparatus of the skin, and the amount and character of the matters excreted. In regard to the extent of this apparatus, Erasmus Wilson says: "I counted the perspiratory pores in the palm of the hand, and found 3,528 in a square inch; now each of these pores being the aperture of a little tube, about a quarter of an inch long, it follows that in a square inch of skin on the palm of the hand, there exists a length of tube equal to 882 inches, or 73.5 feet. Surely such an amount of *drainage* as 73 feet in every square inch of skin, assuming this to be the average of the whole body, is something wonderful, and the thought naturally intrudes itself,—'What if this *drainage* were obstructed?' The number of square inches of surface in a man of ordinary hight and bulk, is about 2,500; the number of pores therefore, is 700,000, and the number of inches of perspiratory tube, 1,750,000, that is, 145,833 feet, or 48,600 yards, or nearly 28 miles."

It has been estimated by Seguin, from careful observations, that eleven grains of matter are excreted from the skin per minute, being equal to thirty-three ounces in twenty-four hours. This consists of—

Organic matter,	107.47	grains.
Saline matter,	81.92	"
Water and volatile matter,	15,650.61	"

The maintenance of the normal condition of this very extensive and highly sensitive tissue, is of primary importance in the preservation of health. This is satisfactorily proven by the morbid conditions so frequently and so speedily induced by the suppression of perspiration, or by derangement of its normal function. When we take into consideration the extent of the cutaneous tissue, the innumerable sudoriferous glands, the ducts of which penetrate it and empty upon its surface, through which much of the effete matters of the system should escape, and through which they do escape, in a state of health, we can not be insensible to the important office which it performs. We can also readily understand the extensive influence which it is capable of exerting upon the whole system if its normal functions are destroyed, and also to the very salutary and extensive influence which may be exerted upon it, and through it upon the entire system, in subverting morbid action in disease.

There are four great emunctories through which all the decayed or decaying materials generated in the system by the processes of disintegration, and which can be no longer subservient to the purposes of the animal economy,—but which if retained, must act as sources of disease, causing fever, irritation, inflammation, etc.,—are excreted. Through these emunctories, the bowels, kidneys, lungs and skin, these obnoxious materials must pass off. Now if any of these excretory organs fail to perform their function, and elimination does not take place, the retained excrementitious materials must become irritants, and if long retained, they will not only vitiate the blood by their presence, but they will communicate the same process of decay to the blood, and hence some variety of fever or inflammation will be the result.

From these remarks relative to the excretions in general, and from the important functions which the skin is destined to perform, the following deductions may be drawn: First, we infer from the great amount of effete material thrown off in this way by this extensive excreting surface, that any cause that may arrest or diminish its normal action, and cause a retention of them, will be a cause of general disease, showing itself in some of the numerous forms of fever; or if some particular organ or tissue be predisposed to take on a diseased action, we may witness a local disease, or one in which the intensity of the excitement is concentrated upon a certain part, while other parts are but sympathetically affected.

"Health," says Dr. Eberle, "is very intimately connected with the regular performance of the perspiratory functions. Whenever the transpiration by the skin is suddenly checked, more or less derangement of the system is invariably the consequence." He further observes, "That portion of the circulating fluid which nature designs to be cast off by the cutaneous emunctories, as no longer fit for the purposes of the animal economy, is retained, and becomes a source of morbific irritation to the heart and other organs." We may also infer from its functions, and from the sympathetic relations which it bears to the glandular, lymphatic, mucous, serous and nervous systems, exalting, modifying or arresting their functions according to its own normal or abnormal condition, that it is an important tissue to act upon, and through which to counteract diseased action, whether excessive or diminished.

Experience has fully convinced us that suppression of the perspiration is a very fruitful source of disease. It is true that this suppression is often counterbalanced by some other emunctory taking upon itself a vicarious action, thus supplying the place of the one whose functions are impaired. We are also quite as well convinced that the restoration of this function is of infinite importance, and that those agents which restore it, whether they act directly or indirectly, are therapeutic agents of the first importance.

The views that we have above expressed relative to the utility of this class of remedies, and the importance of restoring this secretion in numerous diseases, are corroborated by many of our most distinguished authors, as Drs. Wood, Eberle, Thompson, Paris, etc.

In opposition to these views, we present those of Dr. Dunglison. He says: "It may admit, however, of well-founded doubt, whether disease be ever induced by suppression of the cutaneous exhalation." He supposes that cold, operating upon a limited part of the surface of our bodies, morbidly impresses the cutaneous capillaries of that part, and that the local or general disease is sympathetic, or that the internal capillary system sympathizes with the morbid condition of the external capillaries. He says: "This irregular action of the capillaries of the part is the first link in the chain of phenomena, not the obstruction of perspiration." We readily admit that the first morbid impression from cold thus applied, is made upon the superficial capillaries; but this impression consists in a spasm of the minute vessels; the sudoriferous glands do not receive a supply of blood, and their excretory ducts are closed. There is a general cutaneous paralysis, and thus the excrementitious materials thrown into the capillaries to be eliminated, are retained; they accumulate, render the blood irritating, and produce fever, inflammations, etc. If, as Dr. Dunglison contends, the *irregular action* of the capillaries constitutes the *first link* in the chain of morbid phenomena, the superior efficacy of diaphoretics would be none the less important in breaking that "*link*"; for no influence which can be brought to bear upon the system when it is in a state of disease, so effectually subverts capillary excitement as diaphoretics. Yet, strange as it may seem, Dr. Dunglison still further remarks that, "In any mode, consequently, of viewing the subject, it does not appear that we can ascribe any extensive series of morbid phenomena to simple suppression of perspiration. Such being the fact, the indication of restoring suppressed perspiration—if it be admitted at all—must exist much less frequently than has been imagined. He further observes that but few classes are more frequently used, "and probably none which are more uncertain in their operation, and on which less reliance ought to be placed." Again he remarks "Perhaps we have no class of remedies more uncertain in their operation than anatomical diaphoretics, as ordinarily administered. It might indeed be said that there are no agents so devoid of any beneficial action." He finally sums up the matter in such a way that we can not fail to see the little importance which he attaches to this class of remedial agents. He says: "On the whole, then, even in febrile and inflammatory affections, the use of the ordinary internal diaphoretics is uncertain, and generally of no avail."

These views of this distinguished compiler we conceive to be eminently erroneous; instead of diaphoretics being "*of no avail*" in febrile and inflammatory diseases, and instead of the indication of restoring suppressed or diminished perspiration rarely existing, their employment in the cases referred to should constitute one of the cardinal measures in the treatment of such cases, and the restoration of the cutaneous transpiration is to be regarded as an indication of paramount importance. It is true many of the diaphoretic agents act indirectly upon the cutaneous capillaries, removing the spasm, and augmenting the secretions; yet their importance as curative agents, and the necessity of restoring or promoting that secretion is none the less imperative.

Action of Diaphoretics.—Diaphoretics may be divided into two classes, according to their mode of action: the first of these classes act directly upon the glands of the skin, and hence we name them *specific diaphoretics;* the second class produce diaphoresis indirectly, and on account of some other property possessed by them: these may be named *indirect diaphoretics.*

Specific diaphoretics stimulate the sudoriferous glands to increased action, and thus increase the secretion. We suppose that they act in the same manner as specific diuretics or cathartics; they have an affinity for this secreting structure, pass to it, and are eliminated by it; and in this manner stimulate it to increased action. Volatile diaphoretics belong to this class, as also ammonia and its various salts, and some acrid agents, as guiacum, senega, etc. The best example of this class is probably the asclepias tuberosa, or its active principle, asclepin. These agents are not always certain in their action, owing to the peculiar state of the system, or the different hygrometric states of the surrounding air. But as they act directly from the blood upon the secreting apparatus, if this is in a condition to be impressed by stimulus, these agents act as direct diaphoretics.

Indirect diaphoretics may act by *relaxing the cutaneous tissues*, or by *determining the circulation to it*. The effect of remedies which relax the system, in the production of diaphoresis, may be accounted for by the relaxed state of the capillary vessels of the skin, and the readiness with which the watery portions of the blood will pass through their coats in this condition, and also by the relaxation of the tissues surrounding the sudoriferous glands and ducts, whereby they are enabled to freely receive and throw their secretion upon the surface. This condition of the cutaneous surface is produced by emetics and nauseants; we also notice it in the relaxation which follows fever, and in the night-sweats of debilitating or exhausting diseases.

Determination of blood to the skin is an important part of diaphoresis; any thing that will determine to the surface will increase the secretion, providing the cutaneous tissue is relaxed. Thus, in fever we have an increased circulation and determination to the surface, but the skin is constricted, hot and dry, and the walls of the capillaries tense and rigid; hence it is impossible for transudation to take place. But if this tissue is relaxed by nauseant emetics, we then have all the conditions present (if the body is kept warm), for the production of *indirect* diaphoresis.

The action of all diaphoretics is promoted by cleansing the skin, keeping the body warm, and by the free exhibition of warm diluents. Diaphoresis may be produced, simply by bathing the feet in warm water and keeping the body warm. The warm water relaxes the skin, and the heat determines to the surface.

The wet-sheet pack acts in a similar manner. Its first effects are indeed the opposite of diaphoresis; but when reaction takes place, the circulation is determined to the surface, which is relaxed by being in contact with the water.

Lastly, if the skin is kept cool, diaphoresis is prevented; that which would have been eliminated by the skin passes off by the kidneys. Thus, if we wish to produce diaphoresis, the skin should be kept warm, and the fluids taken should also be warm; while, if we wish to produce diuresis, we administer the remedy or diluents cool, and also keep the skin cool.

THERAPEUTIC INDICATIONS.

Very different diaphoretics are demanded in different states of the system. If obstructed perspiration depends upon an exalted vital action, as in fever, *nauseants*, *refrigerants*, *sedatives*, *ablutions* (either tepid or cold), aided by any of the warm diaphoretic infusions, or even cold acidulated drinks, as iced water, lemonade, etc., will diminish the momentum of the circulation, lessen the vascular tonicity, and favor not only the restoration of the cutaneous transpiration, but other organs may be excited to resume their functions also. These agents act as sedatives, and indirectly as diaphoretics; they diminish morbid excitement throughout the vascular system, and particularly in the capillaries, and promote the secretions. A combination of properties as sedative, refrigerant, anodyne, nauseant, expectorant, diuretic, diaphoretic, etc., frequently adds much to their medicinal virtues; a combination of diaphoretics is always better than single articles.

Obstructed perspiration may depend upon a slow and languid circulation, in which case the skin will be shriveled and cold, indicating the cutaneous torpor and internal congestion; in this case a very different class of diaphoretics will be demanded. In these cases copious draughts of warm, stimulating diaphoretic infusions, as the aristolochia, eupatorium, monarda, asclepias, etc., aided by stimulating ablutions and brisk frictions to the surface, will prove most beneficial. These measures tend to relieve the internal congestions or visceral engorgements, by inviting the blood back to the surface, and by the determination to, and excitement of the sudoriferous apparatus, diaphoresis is the result.

In the advanced periods of life, when diaphoretics are demanded, a very different class should be selected to meet the indications. In the diseases of old persons the reaction is feeble; instead of that vigorous constitution and corresponding reaction of youth, their diseases, both febrile and inflammatory, are not attended with a high grade of vascular excitement, and consequently our remedies, both internal and external, to produce diaphoresis, should be of a stimulant character. Nor is it necessary or proper to carry diaphoresis to the same extent, even in the same diseases in aged persons, that we should in the young and vigorous. In such cases we frequently find it necessary, as well as advantageous, to add spirits to even the exciting diaphoretic infusions, and to the warm ablutions.

In the various forms of pneumonia we avoid stimulating diaphoretics, except in the advanced stages of the disease, unless they are combined with nauseants and expectorants. In these cases cold or acidulated drinks, or even stimulating or exciting diaphoretics, unless modified by nauseants and sedatives, are improper. A similar modification in our external applications should be observed. In high grades of fever we admit cold air to the surface, cold ablutions, etc., the whole course being refrigerant during the excitement; but in pneumonia we keep the surface warm, apply warm ablutions, or warm and emollient fomentations to the surface, to invite the blood to the superficial capillaries, in order to relieve the hyperæmia of the lungs, and maintain constant diaphoresis. We resort to diaphoretics devoid of stimulating properties, as the asclepias tuberosa, etc., and we combine them with nauseants.

Diaphoretics are a very important class of remedial agents in all those diseases that arise from atmospherical vicissitudes. In these diseases, torpor of the sudoriferous apparatus constitutes the first link in the chain of morbid phenomena which follow, and diaphoretics constitute our most valuable therapeutic agents to restore that secretion, and thus remove the cause of the diseased action.

I. *Action in Fever.*—Diaphoretics are of primary importance in the treatment of all febrile affections; the class of diaphoretics, and the extent to which they should be carried in particular cases, can only be determined by the stage of the disease, the grade of excitement, the age and vigor of the patient, its congestive, sthenic or asthenic tendencies, etc. All of these circumstances must be taken into consideration in determining the extent to which diaphoresis should be carried, and the proper diaphoretics to be selected and used.

In the early stages of most fevers, if the patient is young and vigorous, copious and protracted perspiration should be secured and maintained by cold or tepid baths, by nauseants refrigerant and sedative diaphoretics, or they may be combined with those possessing stimulating properties. It is proper here to remark, that their employment should be preceded by the free use of cathartics, or emetics if indicated. In similar attacks of old persons, the stimulating diaphoretics and tepid ablutions should be employed, but in this case gentle diaphoretics alone are indicated. In the advanced stage of fevers, especially those of a typhoid type, free perspiration is too debilitating to be tolerated by the system, and should be avoided; but gentle diaphoresis or simple moisture of the surface is beneficial. If the fever is of an adynamic character, gentle and excitant diaphoretics, aided by tepid stimulating ablutions to the surface with brisk friction is very important.

Their sanative powers seem to depend upon a variety of influences which they exert upon the system. First, they remove the constriction of the cutaneous capillaries, and act as depletives by increasing the perspiratory function, and may therefore be regarded as antiphlogistic. Secondly, the evaporation which attends perspiration carries off the caloric, and thus lessens the abnormal heat of the system; in this sense they may be regarded as refrigerants. Thirdly, they equalize the circulation, by determining the blood to the surface; they remove congestion of internal organs. Fourth, they promote the elimination of morbid material from the blood, which if retained would prove a source of irritation, often producing fever, or if it already exists, it would tend to perpetuate it and render its type lower. They modify the condition of the skin, they soften and relax it, they lessen the heat and tension of it, and by an intimate sympathy existing between this extensive surface and every other organ or tissue of the body, a like salutary influence is exerted upon all.

II. *Action in Inflammation.*—The remarks which have been made relative to their utility in febrile disease, and to their therapeutic action, apply with equal force to their employment in inflammatory diseases. It will be recollected, that atmospheric vicissitudes play a very important part in the production of the phlegmasia, as well as fevers. When one organ or tissue is more disposed to take on morbid excitement than another, we meet with a local instead of a general disease; thus a number of persons exposed to the same morbific influences, may be the subject of as many different diseases; or but a small part of the number may contract disease, owing to the predisposition of some systems, or some organs to take on diseased action. Those who do not contract a disease are indebted for their escape to the sound and vigorous constitutions which they possess, for warding off the morbid influences, and securing them against its effects.

In inflammatory, as well as in febrile diseases, they are important as depletives, or antiphlogistics. They remove cutaneous spasms, lessen the morbid heat, abate the fever, produce sedation, invite the circulation to the surface, and thus act as revulsives, equalize the circulation, relieve pain, overcome the tension of the tissues implicated, and thus act as emollients, etc. They thus do as much, if not more, to effect a resolution of the disease than any other class of agents with which we are acquainted, providing proper perseverance and energy of action characterize their mode of employment.

The intimate sympathy existing between the cutaneous surface and the lungs, or between the functions of each, points to the employment of diaphoretics in pulmonic inflammation, as a class of remedial agents of singular efficacy. When perspiration is copious, the skin moist and relaxed, respiration is less painful and less laborious, and the distress or oppression in the chest is mostly, if not entirely relieved. The functions of the skin and lungs, it will be recollected, are analogous in several respects, and a very close sympathy exists between the two. We would therefore suppose that any agent which would relax the skin, and increase its secretion, would prove beneficial in arresting inflammation of the lungs—and experience has proved this to be true.

The same remarks apply to their employment in dysentery and diarrhea. The most superficial observer has not failed to notice the immediate influence which the obstruction of the cutaneous transpiration often exerts upon the bowels. Here, also, we have the same continuous membrane, and the same continuous sympathy, and the modifications of the function of either membrane influences that of the other;

hence the great value of diaphoretics in these diseases. Diaphoretics, possessing anodyne and sedative properties, are of peculiar advantage in these cases. They are revulsives, determining the circulation to the surface, thus relieving internal hyperæmia. They are anodyne, and lessen pain and dysenteric tenesmus. By their anodyne and sedative influence they lessen the pain and irritation in the bowels, diminish the mucous and intestinal secretions, and also diminish the augmented peristaltic action upon which the frequent discharges are dependent. They excite the cutaneous emunctories, equalize the circulation, break up morbid sympathies, and throw off the excrementitious matters which if retained can not fail to derange the system, and increase the existing disease.

III. *Action in Rheumatism.*—Diaphoretics are of much importance in rheumatism, and they probably owe their beneficial influence not only to the effects which have been before alluded to, but also to their eliminative action in removing from the system a morbid material upon which the disease depends. Dr. Williams states that " The *perspiratory secretion* contains lactic acid and lactates of soda and ammonia, which probably proceed from the transformation or decay of the textures, particularly the muscular, which the recent researches of Liebig have shown to contain a preponderance of this acid. Hence these products abound during great muscular exertion, and when perspiration is checked by external cold, they may be retained in the blood, causing rheumatism, urinary disorders, or various cutaneous diseases. The very serious effects sometimes resulting from sudden cold on the perspiring body may be partly owing to the same cause, as well as to the disorder produced in the circulation. Rheumatism is especially liable to occur as an effect of cold, where the body is fatigued with much muscular exertion; and I have frequently observed that the rheumatism chiefly affects the limbs which have been most exercised. Where the skin fails to excrete, an increased task is thrown on the kidneys, whence may result various diseases of these organs; and if these organs fail in the task, the lactic acid accumulates in the blood, and probably acting as a ferment, causes the formation of more, and of the kindred products, lithic acid and its compounds and products; these, in inflammatory subjects, excite rheumatic fever; in cachetic persons, miliary fever, erysipelas and pemphigus; and in more torpid frames, various local rheumatic or gouty affections. All these cases are frequently remarkable for the acid character of the cutaneous and renal excretions; and in a few instances, the blood has been found to possess acid qualities, or to be deficient in its usual alkaline reaction."

The direct action of diaphoretics in this disease is, then, to stimulate the sudoriferous apparatus to increased elimination, and as *lactic acid* is a normal constituent of this secretion, it is removed from the system in large quantities; *lactic acid* being the supposed cause of rheumatism, its removal is followed by a cessation of the disease. Such agents as increase both the secretions from the skin and kidneys, prove most advantageous; and as the materies morbi is an acid, we would suppose that alkaline diaphoretics and diuretics would prove the most valuable agents, and experience fully substantiates this conclusion. As the type of such a diaphoretic, we may mention the compound of asclepias tuberosa (℥j.), eupatorium perfoliatum (℥j.), sanguinaria canadensis (ʒij.), and nitrate of potassa (℥ij.); in this we have active diaphoretic and diuretic agents, with the alkali to neutralize the excess of acid.

Again, by promoting perspiration, we cause relaxation of the system, equalize the circulation, and remove the tension of the inflamed part. To fulfill these indications, we not only administer diaphoretics, but we also resort to emollient fomentations, to the alcoholic vapor-bath, to embrocations, brisk frictions, etc., to relieve the pain, subdue the irritation and inflammation, and assist in producing diaphoresis. Moderate diaphoresis sometimes gives much relief in gout, but the employment of these agents is not as beneficial as it is in rheumatism.

IV. *Action in Cutaneous Diseases.*—In the acute exanthematous diseases, this class of agents proves very beneficial. Moderate diaphoresis tends to advance the eruption, and moderate the febrile action, and in cases where the eruption is tardy, or where there has been a retrocession of the eruption, stimulating diaphoretics, aided by tepid ablutions of an excitant character, are of decided utility.

In the chronic cutaneous forms of disease, as in *herpes*, *lepra*, etc., a moderate moisture of the surface, promoted by the use of the medicated vapor-bath, continued for weeks, or even months, constitutes an important part of our remedial treatment.

V. *Action in Dropsy.*—In dropsies they are less beneficial than we might be led to suppose. From the large quantity of serous fluid which they evacuate, we should suppose they would be important, but experience does not confirm this view; they occasionally, however, prove important. In dropsy it is difficult to induce sweating; if, however, we succeed, advantage results from their use. The use of the tepid-bath, with brisk frictions to the surface, tends to invite the circulation to the skin, restore the perspiratory function which is always torpid, and promote absorption, which is an indication worthy of our attention in this disease.

VI. *Action in Disease of the Kidneys.*—The kidneys are closely connected in function with the skin, and when either is diseased the other performs a vicarious function, its secretion being increased to make up for the deficit in the other. Thus in suppression of urine, the perspiration sometimes acquires a marked urinous odor, and when the skin fails to perform its function, the secretion of the kidneys is increased. From these facts we can readily appreciate the importance of diaphoretics in renal diseases. Thus, in nephritis, no measures that can be adopted will produce such speedy relief as the production of free diaphoresis; they not only equalize the circulation, and thus remove the congestion of the kidneys, but they likewise remove much of the material that would have been excreted by the kidney in its normal condition. The same remarks will apply to other acute diseases of these organs.

Suppressed or diminished perspiration is supposed to exert some agency in the production of calculous affections. In some of these conditions of the system they may prove beneficial by removing the irritation of the kidney, and by causing the skin, for the time being, to perform a vicarious function.

We might extend the same remarks to their employment in diabetes. By determining to the surface, we change the organ of depuration, we throw the burden upon the skin and relieve the kidneys; hence the importance of the induction of a constant and free action of the skin. The frequent use of the hand-bath, accompanied with brisk frictions, cleanses the skin and invites the circulation to the surface, and gives the kidneys an opportunity to regain their normal vigor. In connection with this, hydragogue cathartics, stimulating diuretics, tonics and astringents, coöperate in effecting a cure.

RECAPITULATION.

1st. Diaphoretics are important both as depletives and eliminatives, lessening vascular repletion, and promoting the elimination of effete materials existing in the system.

2d. They overcome the vital tonicity and cohesion of the capillaries of the surface, and thus promote perspiration, equalize the circulation, counteract congestion, and serve to lessen fever and inflammation.

3d. By their excitant action on the sudoriferous follicles and capillaries of the surface, they act as mild, but none the less efficient revulsives, diverting excitement from internal organs, equalizing the circulation, and thus proving very efficient agents in the treatment of inflammation of any of the internal viscera.

4th. The surface is the great refrigerator (as well as one of the great depurating organs of the system), and hence the utility of suitable diaphoretic means and appliances; diaphoresis serving to carry off the morbid heat of the surface, and lessen the excessive generation of caloric. Either cold or warm ablutions, as well as internal agents, may facilitate this result.

5th. Diaphoresis promotes absorption by reducing the serum of the blood; and hence their utility in dropsies, particularly in those of a sthenic character.

6th. Diaphoresis exercises an emollient influence upon the entire surface, according to its degree, by which a soothing and relaxing influence is extended by contiguous and continuous nervous and capillary sympathy, to deep-seated and remote parts, lessening internal excitement and inflammation. By this means they may arrest fever or inflammation, modify or change its type for the better, if they do not effect a radical cure.

7th. They are useful both in acute and chronic diseases; free sweating being indicated as a general rule in the acute forms of disease, and an increase in the insensible transpiration in chronic affections.

8th. The extent of their use in acute disease, must depend upon its duration, they being used freely in the early stages, and before there is much exhaustion; and less freely, or even sparingly, after the patient has become prostrated by its duration.

9th. In diseases attended with a high degree of excitement, nauseating and sedative diaphoretics, with the free use of ablutions, either tepid or cold are demanded.

10th. In coldness of the surface, with a languid state of the circulation, accompanied with internal congestion, excitant and stimulating diaphoretics, assisted by warm or even hot stimulating baths, are indicated.

11th. In old age, and in the advanced stages of disease, if attended with debility, diaphoretics of a tonic and stimulating character are indicated.

12th. Suitable diaphoretic measures, modifying as they do every organic function of the body, are among our most important curative, as well as auxiliary means in the treatment of nearly all diseases.

CLASS IV.

DIURETICS.

DIURETICS are those agents which, acting on the kidneys, promote the secretion of urine. The renal secretion is one of the most important depurants in the body, removing in twenty-four hours, in health, from 600 to 700 grains of solid matter. This material is the product of the disintegration of the nitrogenized tissues of our bodies, and is so constituted that it can not be retained without producing disease. Such agents then, as will restore this secretion when diminished or suppressed, or that in certain states of the system will greatly increase it, can not but be regarded as among our most valuable means of removing disease.

The kidneys differ from all other secretory organs in being adapted to perform two entirely separate and distinct functions; this adaptation being manifested by their anatomical structure. These functions are the excretion or pumping off of the excess of water from the blood, and removing from the blood certain nitrogenized matters, the products of the waste of the tissues. The first merely relieves vascular turgescence, while the second is depurative, removing morbid matters from the blood.

The solids of the urine constituting its proper secretion, are *urea*, *uric acid*, *creatine*, *creatinine*, *hippuric* and *lactic acid*, and the soluble salts.

Urea forms the largest amount of the solids of the urine; 270 grains, or more than half an ounce, being excreted by a healthy adult in twenty-four hours. Its chemical formula is C_2, N_2, H_4, O_2. This is a highly nitrogenized compound, and constitutes the form under which a large quantity of nitrogen is expelled from the system. Urea is produced by the disintegration of the worn-out tissues of the body; it contains as much as five-sixths of the nitrogen taken into the body, and it constitutes the mode by which the largest portion of nitrogen is removed from the body. Dr. Golding Bird states, that "Its origin must be traced to the destructive assimilation of those tissues of the body which are removed to make room for new matter. Minute quantities of urea escape from the system by the skin, but this body is removed so rapidly from the blood by the kidneys, that very minute traces of it only can be obtained, unless these organs become diseased, and are then no longer fitted to perform their important functions of depuration."

The effects produced by the retention of this element in the blood, from defective secretion of the kidneys, is well shown by the experiments of Prevost and Dumas. They extirpated the kidneys of dogs; on the third day after the operation, vomiting commenced, there was diarrhea of a copious brown liquid, fever, with heat varying as high as 110°, and sometimes as low as 92°; pulse very small and frequent, breathing labored, death ensued from the fifth to the ninth day. After death there was found effusion of serum in the brain, copious mucus in the bronchia; the liver was inflamed, and the bladder much contracted; the blood was more watery than natural, and contained urea, five ounces of the blood of a dog yielding twenty grains of urea. The symptoms appearing in man from retention of urine are obstinate vomiting, diarrhea, typhoid symptoms, low muttering delirium, epileptic convulsions, coma, etc. All these effects, says Dr. Williams, may be traced to excrementitious matters being retained in the blood, especially *urea*, which has, in very many instances, been detected in considerable quantities—in the greatest amount acting on the system as a narcotic poison; in smaller, acting as an irritant, inducing low inflammations in various membranes and viscera; and in a still lower degree causing sundry functional disorders, fluxes and dropsies, impoverishing the blood, and inducing degeneration of certain textures.

Uric acid, *creatine* and *creatinine*, are substances similar to urea; that is, highly nitrogenized bodies. Like urea they are excrementitious substances, the product of the waste of the tissues; their amount is small compared with urea, but they are probably as deleterious to the system, according to their quantity, as that body. *Hippuric acid* is also a small constituent of the urine of man, and not always present. It differs from the others in containing but a small proportion of nitrogen, and is probably formed by the disintegration of the carbonaceous tissues.

From what has been stated above, it will readily be seen that this is one of the most important excretions of the body. Through the kidneys we have eliminated a large amount of the excrementitious materials formed by the disintegration of the nitrogenized tissues of the body; and it has been satisfactorily proved that the materials thus excreted, if retained, will act as a most virulent poison on the system. If this excretion is, then, so important in health, what must it be in disease, when disintegration of the tissues of the body is actively going on? And what benefit must be derived from such agents as will promote their elimination?

Action of Diuretics.—Diuretics are absorbed into the circulation, and act directly upon the secernent structure of the kidneys, as is evident from the reappearance of those substances in the urine. The same agents, if injected into the bloodvessels, will exert a similar influence upon the renal secretion. To those agents which increase the secretion of urine, whether taken into the stomach or absorbed from any other portion of the system, or injected into the veins, in suitable quantities, the term *direct diuretics* is appropriate, and to those agents it is frequently, and should be exclusively applied.

Other agents may exert an indirect influence over the urinary secretion, as diluents, by causing vascular repletion, and thereby causing an increased action of the kidneys to remove the water. Cold applied to the surface lessens the amount of the cutaneous secretion, and thereby imposes an additional burden upon the kidneys, and when they are able to perform this function, increased diuresis follows. Cathartics sometimes greatly increase the amount of this secretion, by removing congestion of the kidneys, by producing revulsion to the bowels, etc. In consequence of these and other agents promoting diuresis by these indirect influences, they may be termed *indirect diuretics.*

Those agents only should be named diuretics, which act directly on the kidneys, and stimulate them to increased action, and not those which act on some other organ first, and subsequently exert an indirect influence on the kidneys.

Some of the direct diuretics merely increase the water of the urine, without a proportionate increase of the solid constituents; to these Dr. Golding Bird gives the name of *renal hydragogues*. Though this class of agents greatly increase the fluid portions of the urine, and thus diminish its specific gravity, yet it is found that the solids are increased, though not proportionately; the excess of water washing away but a small additional amount.

Others, having a direct chemical action upon the body, greatly increase the amount of the solids, either with or without a proportional increase of the entire amount of the urine. To these Dr. Bird gives the name of *renal depurants*.

In regard to the action of the *renal hydragogues*, Dr. Bird lays down the following proposition: "Remedies which exert no chemical action on organic matter out of the body, appear to be incapable of augmenting the quantity of solids in the urine, and hence are only of use in increasing the elimination of water—they may and do act as renal hydragogues, but not as renal depurants." In proof of this proposition, we may adduce the following table, calculated by Dr. Bird, from Krahmer's observations:

Medicines given.	Solids in the urine of 24 hours.	Combustible (animal) matter in.	Saline matters in.
None, - - -	2.40 ounces.	1.28 ounces.	1.18 ounces.
Juniper, - -	2.12 "	0.94 "	1.18 '
Venice Turpentine,	1.94 "	1.11 "	0.83 "
Squills, - -	2.25 "	1.04 "	1.21 "
Digitalis, - -	2.45 "	1.28 "	1.17 "
Guiac, - -	2.48 "	1.88 "	1.05 "
Colchicum, - -	2.32 "	1.86 "	0.96 "

Renal depurants, though they generally increase the amou of urine passed, greatly increase the solid constituents of i This they do, not only by stimulating the proper secretory apparatus of the kidney, but by increasing the metamorphosis of tissue within the body. The agents composing this class all exert a chemical influence upon dead animal matter, and when absorbed, they tend to break down all the imperfectly organized tissue, and by their direct action upon the kidneys they cause it to be excreted. This class of agents embraces the alkalies, the carbonates and their salts, with such acids as in the animal economy are capable of being converted into carbonic acid, including the acetates, citrates, and tartrates of soda and potassa. In regard to their action we may adduce the following example from Dr. Bird:

	Without Medicine.	After ℥iij. pot. acet.
Quantity of urine in twenty-four hours,	f℥xvj.	f℥xlvj.
Specific gravity of, - - -	1.025.	1.017.
Solids in, - - - -	416 grs.	782 grs.

The reason why, probably, this class of diuretics is not held in greater repute by many practitioners is, that in fevers and other acute diseases, attended with increased metamorphosis of tissue, the vegetable *hydragogue diuretics* are administered instead of the true *renal depurants.* We are satisfied that this is the fact, and would call the attention of the reader especially to this latter class. In the diseases just named the worn-out and exhausted tissues, floating in the blood, become a constant source of disease; in many instances we may assume that it is *the disease*—they are, however, in such a condition as not to be readily excreted. Now, it is a well known fact, that the alkalies break up these into various secondary products, even without the body, and we may readily suppose that the change that takes place in the circulation is such as to fit the worn-out tissues for excretion.

Dr. Bird makes the following highly interesting observations upon the case given above, in which the acetate of potash was given, and upon the use of diuretics: he says, "The results of these analyses show that, after deducting the excess in the amount of soluble salts, arising from the conversion of cetate of potassa into carbonate in its transit from the stomh to the kidneys, the solids of the urine, separated from he blood under the influence of the chemical diuretics, exceeded those excreted without its aid by one hundred and ninety grains. We further learn that, although a large proportion of matter was metamorphosed into both uric acid and urea, after the administration of the acetate, still that the greatest increase was in that mixture of organic products set down as *extractive*, and which, as we have seen, consisted chiefly of creatine, creatinine, uroxanthin, and matter rich in sulphur. In the example adduced, not only did the patient lose an excess of thirty ounces of water in twenty-four hours, but she wasted to an extent of one hundred and ninety grains more than if no remedy had been given; and to this extent had the blood been depurated of those elements which yielded easiest to the influence of the alkaline salt. As it can not be denied, that vital force is ever active in opposing the chemical changes to which all living fibers are obnoxious, it is fair to assume that this resistance will increase with the vital endowments of a part; or, in other words, that the elements of our frames resist chemical influences in the ratio of their vitality; it would follow that such constituents of our bodies as present the greatest departure from health, are less highly vitalized, and thus would be expected to yield the easiest to the influence exerted by the alkaline diuretics, or renal depurants. As a result of this view, we should expect that when we cause an alkaline carbonate to circulate through the blood, it exerts an influence on the nascent elements of those matters less highly influenced by life, resembling that which it exerts on dead matter, aiding their resolution into substances allied to those produced out of the body, and actually causes the matter to assume so soluble a form as to allow of its ready excretion. This remarkable effect of the alkaline diuretics (although now *demonstrated* by actual experiment, and the results of their chemical influence detected in the stream by which they are washed from the body) was not overlooked by the observing physicians of former years. It was, indeed, acted upon by the old physicians—witness the host of apozems, diuretic decoctions, and diet-drinks, in which renal stimulants abound; and let us not shut our eyes to the success of the practice; for unless we deny all credence to the statements of the painstaking practitioners of past times, those who will read their quaint records of cases, will learn how generally they succeeded in curing the effects of a *caco-æmia*, an unhealthy blood, as evidenced in various eruptive affections, cellular membranous sores, furunculi, and very many such ailments. It is true, that in looking at some of their prescriptions we do not generally observe rem edies which have now much confidence placed in them as trustworthy diuretics; but then an important element of their potions is, most undoubtedly, the water of the decoction employed, not in doses of tablespoonfuls, but as was common in former days, of pints. A most important truth here demands our attention. It may be said, that it is true that if a patient takes a pint or two extra of water he will, supposing that no organic lesion exists, excrete a large bulk of urine from the necessity there exists for pumping off the excess of diluent partaken of. In this way a pint or two of water becomes a diuretic: this every one's experience will enable him to admit; but what is this, it may be asked, but the mere drawing off of excess of water—where is the proof of blood-depuration? This proof is afforded by calculating the amount of solid constituents of the urine. It will then be found that the excess of water does not escape alone, but there is really washed away with it, a certain, although not very large, quantity of solid debris."

THERAPEUTIC INDICATIONS.

I. *Action in Febrile and Inflammatory Diseases.*—In all febrile diseases, there exists generally a torpor of the excretory organs, and hence the metamorphosed tissues—the worn-out materials of the system—are not eliminated, but remain in the circulation. We have also mentioned the fact in a previous part of this work, that fever in a majority of cases is caused by, either the retention of an excretion, which acts as a foreign matter,—a ferment in the blood,—or by the introduction of such a material into the circulation from without. In either case the decaying matter while in the circulation, acts as a ferment, transmitting its decomposing tendencies to every portion of the blood that is not sufficiently vitalized to resist this chemical influence. If such is the case, and we believe it is well substantiated, we can plainly see the beneficial effects that would follow the use of such agents as would cause the elimination of an ounce and a quarter of this excrementitious matter every twenty-four hours.

Renal depuratives are then indicated in all febrile diseases, for their eliminative action. They not only stimulate the kidneys to normal action, removing such material as is already fitted for excretion, but by their chemical action while in the circulation, they so change the less vitalized portion of the circulating fluid that it is also excreted. The alkalies and their salts, which form the principal agents of this class, also act as refrigerants, lessening the heat of the body. When we wish to produce this effect, we administer a salt of some of the organic acids, the acetates, citrates, etc: this salt in its passage through the blood to the kidneys, is converted into a carbonate. In order to convert one equivalent of such a salt (for instance the acetate of potash), into a carbonate, eight equivalents of oxygen must combine with it. This oxygen, therefore, which is appropriated by the diuretic, is abstracted from the amount which would have acted upon the tissues of the body, and not only is there a less amount of heat generated, but there is also a marked decrease in the waste of the tissues, owing to the fact that the remedy has appropriated oxygen, which otherwise would have acted directly upon them. We have therefore four effects from such a salt: first, it stimulates the kidneys and causes an elimination of such material as may readily be excreted by them; second, it so changes those parts having a low degree of vitality that they are fit material for excretion; third, by appropriating oxygen to form a carbonate it proves refrigerant; and lastly, it diminishes the production of effete matters — the breaking down of the tissues by presenting their oxygenation.

In sthenic fevers they act as antiphlogistics, that is, according to many eminent authorities, they have the power of diminishing the amount of fibrine in the blood. Guliver has also noticed that they counteract the tendency of the blood-corpuscles to become aggregated in rows, a tendency especially observed in inflammation; and by diminishing the amount of the serum, they lessen vascular repletion.

In asthenic or typhoid fever, they indirectly increase the strength of the patient, by removing the materies morbi, which so depresses the vital powers, and especially the brain and nervous system; and may not the change which they effect in such material, even if it is not excreted, prevent its acting as a ferment in the blood?

Dr. Golding Bird states that he has found them of great value in remittent and intermittent fevers; though they are not antiperiodic, yet he believes they will effect that which quinine and its allies can not do. He says: "When to a person suffering from the effects of marsh malaria, acetate of potash has been administered to the extent of ʒij. in the course of twenty-four hours, largely diluted, and continued for two or three weeks; not only is no injury effected by the remedy, but the most marked benefits are observed to result The patient's skin becomes less dusky, the expression more healthy, the dull aspect of the eyes changed for one of cheerfulness, the engorgement of liver and spleen lessens, and the paroxysms of 'dumb ague' disappear."

The vegetable *hydragogue* diuretics are also useful in these diseases, and especially is this the case when they are given in infusion or decoction. The diuretic agent stimulates the kidneys to remove the serum of the blood, and thus the vessels are depleted, while the water of the decoction or infusion acts as a depurant, washing away some of the detritus of the system. They are, however, comparatively unimportant agents, in these diseases, so far as their diuretic properties are concerned; but many of them exert other influences upon the system, which may be beneficial.

II. *Action in Rheumatism.*—The class of diuretics termed *renal depurants*, are among our most valuable agents in the treatment of rheumatism. In several instances we have witnessed the beneficial action of the acetate, or nitrate of potassa, in these cases, with surprise. We have seen the severe symptoms disappear in twenty-four hours, and in a few days the patients would be well. This, however, is not invariably the case; for we have also known instances where, unless they were combined with other agents, they produced no effect. In such cases, however, a combination that will effect both the cutaneous and renal excretions, as the combination named under the head of diaphoretics (eupatorium perfoliatum, asclepias tuberosa, sanguinaria canadensis and nitrate of potassa), we have never known to fail, if properly carried out.

Dr. Golding Bird strongly recommends the acetate of potassa in this disease; and the success of his treatment, in the wards of the London Hospital, would go to prove that he has not overestimated its value. In regard to its use, he says: "I would not willingly use language which was not completely compatible with experience; but I do not still hesitate to declare that I have never seen the disease in question yield with so much facility to any other remedy. In the severest cases which have been admitted into the hospital under my care (and I prefer alluding to them rather than to cases in private practice, as they have the advantage of being watched by many, and less chance of error arising in the reports of the progress of the patients), I have seen the cure to be more rapid, and the immediate relief to the patient more marked by the use of the acetate of potassa, in quantities of half an ounce, administered, largely diluted, in divided doses, in twenty-four hours, than by any other treatment. In three days I have repeatedly found the exquisite pain of the joints nearly absent, the patient comparatively comfortable, and able to bear with greater ease the helpless state in which the still swollen joints place him. In no case has any ill effect followed the use of the remedy, and while the cure has been far more expeditious, the ill effects of colchicum and mercury have been avoided. The pain remarkably and suddenly lessens, as soon as the urine becomes alkaline, and rises in specific gravity."

In chronic rheumatism, these agents are also very valuable. Whenever they produce a marked increase of the solids of the urine, the disease yields to their use. The beneficial effects of the iodide of potassium, is, probably, due to a greater extent than is supposed, to the diuretic properties of this salt. In two cases particularly noticed by us, where this agent proved beneficial, it acted as a diuretic, the solids of the urine being much increased; and in other cases we have derived similar benefit from other salts of potassa.

III. *Action in Chronic Diseases.*—In chronic disease, where there is evidence of an unhealthy state of the blood, the class of renal depurants will be found highly beneficial. They may be truly called *alteratives* in many cases; that is, they remove the vitiated materials circulating in the blood, and thus promote digestion, assimilation and nutrition. We have seen the habitually coated tongue, the sallow skin, cutaneous eruptions, foul stomach, etc., disappear under their use, when tonics and restoratives had proved of no avail

And may we not ask, is not the beneficial effect of our compound sirup of stillingia and iodide of potassium, so frequently used in such cases, partly due to their acting as renal depurants? We have noticed under their employment an increased amount of the solids of the urine, which would tend to prove it.

IV. *Action in Dropsy.*—As we have already given a some what extended account of the action of diuretics in this disease, under the head of cathartics, a short notice will suffice here. The class of diuretics principally used in dropsy are those termed *renal hydragogues*, or those that increase the fluid portions of the urine: of these some are topical stimulants to the kidneys, others to the entire system, while still another class are sedatives. They prove curative in two ways: first, by removing the serum of the blood, and second, by their derivative influence.

All diuretics decrease the fluid portions of the blood, and thus they not only lessen the amount of fluid circulating in the vessels, but they also destroy the balance existing between the solids and fluids of the blood. We have already referred to the law that when a portion of the circulating fluid was abstracted, absorption through the veins became active, in order to replace the amount so removed. If no fluids are ingested to replenish this loss, absorption will take place from any fluid that has been effused; and this dropsical effusion will be taken to supply the amount of serum abstracted.

Undoubtedly much advantage is often secured by the derivative influence of diuretics, particularly those of an exciting character. They stimulate the kidneys to increased activity, and render these organs the center of fluxion to which the circulating fluids are directed in increased quantities, and from which the serum is abstracted by the increased activity of these organs. While this local derivative action continues, the vessels implicated in the diseased action, and from which the serous exhalation or dropsical effusion is taking place, are relieved of their burden, and allowed an opportunity of recovering their tone. This point is no longer the center of fluxion, or, at least, it is only so in a diminished degree; consequently, the effusion ceases, or becomes diminished in proportion to the action of the renal stimulant.

The sedative diuretics are indicated in sthenic habits, or whenever there is dropsical effusion attended with vascular activity; they are contraïndicated when the habit is asthenic, as when the dropsy is of a passive character, the stimulant diuretics are required.

It must be borne in mind that hydragogue cathartics are of primary importance in all cases of dropsy, while diuretics are but secondary, though important; and this is especially true in dropsies arising from indurations or visceral engorgements of any kind. In such cases hydragogue and deobstruent cathartics are not only important therapeutic agents, but they are indispensable to success.

V. *Action in Diseases of the Urinary Organs.*—In diseases of the urinary organs they become the most efficient agents at our command. In acute inflammation of any portion of the urinary apparatus, refrigerant and demulcent diuretics are of the first importance; they increase the quantity of the urine, and being excreted with it, they lessen its acrid character, and lessen its irritant action upon the inflamed tissues. In chronic inflammation, catarrhal affections, or in cases of ulceration of the mucous membrane of the urinary passages, the balsamic diuretics are demanded; these agents probably act as direct local stimulants, and by the new action which they set up, the morbid process is relieved. The tonic and astringent diuretics, as the uva ursi, pipsissewa, buchu, etc., often prove highly valuable in the same cases. They are also used in diabetes, in conjunction with other agents, with decided advantage. The same class of agents are often employed in combination with the mineral acids, in cases of phosphatic deposits, and with alkalies in cases where the lithates are in excess. In these diseases they seem to act by medicating the urine, which comes in direct contact with the diseased tissue, and in this way they act as topical remedies. The balsam of copaiba, cubebs, etc., probably owe a portion of their virtue in the cure of gonorrhea to their impregnating the urine with their medicinal properties, and being thus brought into direct contact with the inflamed mucous surface.

RECAPITULATION.

1st. Diuretics are useful in any disease in which there is a diminution or suppression of urine; in such cases they stimulate the kidneys to normal action, and thus promote the elimination of the normal constituents of the urine.

2d. A certain class of them greatly increase the solids of the urine, not only by causing an elimination of such materials as are already fitted for excretion, but also, as we suppose, by so changing the less vitalized material as to permit its elimination.

3d. The alkaline diuretics not only increase the solids of of the urine, and thus prove eliminative, but they also act as refrigerants, and to some degree prevent the disintegration of the tissues of the body, by combining with a portion of the oxygen in the circulation.

4th. They promote the absorption of dropsical effusions, by lessening the quantity of the circulating fluid, and by destroying the balance between the solids and fluids of the blood—absorption being active in proportion to the diminution of serum in the vessels.

5th. They act as counter-irritants, causing the formation of a new point of excitement and fluxion, by which means other parts are relieved.

6th. They act topically in diseases of the urinary organs; their virtues being in part transmitted to the urine, they are brought into direct contact with the diseased tissue.

7th. They augment the elimination of water, and thus enable the urine to hold in suspension any material requiring much of this fluid to hold it in solution. They also act as solvents in calculous affections; but most probably this is only in proportion to the amount of water excreted—water, according to the best authorities, being the best solvent for "stone."

DIVISION II.

CLASS V.

SEDATIVES.

SEDATIVES may be defined to be those therapeutic agents which calm or diminish irritation, and directly depress the vital forces. They may be divided into general, and special, the first exerting their depressing effect upon the entire system, the second producing a similar effect upon a special part.

Sedatives are commonly classed with narcotics, but as the latter agents act first as excitants before producing their sedative influence, and as they exert a special influence over the *intellectual functions*, are anodynes, and produce sleep, there is a marked boundary between the two classes. Again, sedatives are not ordinarily used to lessen pain or procure sleep, but as *contra-stimulants* or direct depressors of exalted vital force either in the entire system, or in but a portion of it. From these facts we think a division of the two classes of agents may with propriety be made, notwithstanding the line of demarkation is not always very conspicuous between them.

Sedatives may either act directly upon the nervous system, producing sedation (*direct sedatives*), or their sedative influence may be dependent upon some other effect produced by them; sedation being dependent upon an exhaustion caused by the action of the agent, in this case we would name them *indirect sedatives*. Refrigerants exert an indirect sedative influence, as also do cathartics, emetics, diaphoretics, etc.; they depress the vital forces from their primary action, but their modus operandi differs widely from the *direct* sedatives.

Action of Sedatives.—Direct sedatives, like narcotics, are soluble in the fluids of the body, and are hence absorbed and conveyed by the blood to the part of the nervous system upon which they tend to act. That they are absorbed is proved by the fact, that their action is the same whether applied endermically, injected into the serous cavities, or into the veins. They are nerve medicines, producing their effect upon the nervous system entirely, and are thus like narcotics, transitory in their action. Some of them influence the entire nervous system, while others, unlike narcotics, expend their entire force upon some particular nerves.

They may either derange or destroy nervous force; in the first instance they would produce an abnormal action of the entire system, or the part to which a particular nerve was distributed. "All the varieties in action of sedative medicines," says Headland, "may be accounted for by considering that they may either derange or destroy the nervous forces. In the case of each set of nerves of the body we may distinguish an action of derangement and an action of destruction, both producible by sedative medicines. Thus by an action on the motor nerves of the cerebro-spinal system, convulsions or paralysis may be produced. By an influence on the nerves of sensation, pain, or anæsthesia. By an affection of the organic nerves of the heart, or of the brain which controls them, palpitation or syncope. By an action on the nerves of the lungs, cough, or apnœa. By the exertion of a sedative power over those of the stomach, nausea may result, or vomiting. These various symptoms are all brought about by sedative medicines, but in each case the first effect is referable to a derangement, the second to a loss of nervous power. In every instance there is an impairment of natural nervous force."

Direct sedatives as a general rule, produce sedation, or paralyze the nerves with which they come in contact; thus hydrocyanic acid or aconite if applied to the skin, numbs the superficial nerves; if applied to the tongue they not only deaden its sensibility, but they also in some degree paralyze the muscles. From this we may readily conceive what their action would be when brought into direct contact with the entire nervous system through the circulation; there would be the same paralysis of the sensory nerves and diminished sensation, the same paralysis of the motor nerves, and loss of motion.

We may say then that the influence of direct sedatives is exerted directly upon the nervous system, innervation is diminished, or if poisonous doses are taken is entirely destroyed, while the organic action of respiration, circulation, etc., is diminished, or entirely stopped.

In proof that their effects are transitory, we may mention the fact that in poisoning by hydrocyanic acid, when the quantity taken is not too large, if artificial respiration is maintained, and the arterialization and circulation is thus carried on for a time, the nervous system may recover from the deadly effects of the agent, and resume its normal function.

The further description of the operation of this class of agents may profitably be deferred until we consider the several agents individually, as each acts in a somewhat different manner from the others.

THERAPEUTIC INDICATIONS.

Sedatives reduce the momentum of the circulation by arresting the innervation of the heart; the pulse becomes slower and weaker, when the patient retains the recumbent position; but its rapidity is often increased by any muscular exertion, the increased action compensating for its diminished energy. They lessen the action of the respiratory organs; by deadening the sensibility of the pneumogastric nerve; they diminish the sensation of want of air, and hence, even if the motor nerves were not affected, respiration would be slower. As the respiration is slower, the amount of oxygen conveyed into the system is less in quantity, and calorification is diminished. They lessen the tonicity of the muscular fiber, by their paralyzing effect upon the motor nerves. This is apparent from the general relaxation which follows their employment, and by the softened feel of the pulse at the wrist.

The primary influence of the proper stimulants is most undoubtedly exerted upon the cerebro-spinal system, as is the case with sedatives; and the influence of sedatives is directly antagonistic to, or the reverse of stimulants.

From what has already been stated, the therapeutical application of this class of remedies must be apparent; they are adapted to all cases of exalted organic action, inflammation, fever, etc. The excited heart, elevated temperature, hard and unyielding pulse, and the disordered state of the special senses, call for the administration of remedies fitted to appease their exalted energy; and such agents we have in the class we are now considering.

I. *Action in Fever.*—In fever of a sthenic character, accompanied with a high grade of reaction, both *direct* and *indirect* sedatives may be used with great advantage. The latter class of agents are in general use in such cases; thus we often administer emetics in nauseant doses, to produce their sedative influence during the febrile paroxysm; by them we produce a direct sedative influence upon the nervous centers, the action of the heart is lessened, the respiration is slower, and the muscular system is relaxed. Specific emetics, however, if given in nauseant doses, without producing vomiting, might with much propriety be classed with sedatives; they act upon the nerves as special sedatives, producing their nauseant and emetic effect, it is supposed, by their influence upon the pneumogastric nerve. Their beneficial effect in sedative doses, we suppose, is also exerted upon this nerve, and by this special sedation they lessen the action of the heart and lungs. The sedative action of these remedies, however, is partially antagonized by the reaction accompanying emesis.

Direct sedatives, as aconite, veratrum viride, etc., exert a like sedative effect to emetics, without, however, producing nausea, or the reaction produced by vomiting. By their action upon the nerves of the heart and lungs, they check the excited action of these organs, reduce the frequency of the pulse, and produce relaxation of the entire system. Thus, under the use of the two agents named, we have seen the pulse reduced from 130 beats in a minute to 70; the pulse would become soft and full, the system relaxed, and perspiration induced. If the effects of the remedy were permanent, there would be but little need of other medicine; but as the agents are neurotic, their effects are transitory, and without the agent is repeated, the advantage gained is soon lost.

The question might then arise, if their effects are so transient, what benefit will be gained by their administration? In the first place we prevent the progression of the disease until other remedies have had time to produce their remedial effects; we also induce a state of the system that is favorable for the operation of remedies generally considered to be curative. Thus we may easily produce diaphoresis when the system is thus relaxed, and by this means reëstablish a normal secretion, and cause the elimination of any morbid material existing in the blood. Their action in this respect will be seen to be the more important, when we reflect that these diseases frequently arise from suppression of this secretion, and with what difficulty it is ordinarily reproduced in high grades of fever. The same remarks will apply to other secretions with the same propriety; for instance, the kidneys in fever do not eliminate from the blood their normal secretion; nor can we produce diuresis during high febrile excitement, without great difficulty; yet under the relaxing influence of one of these sedatives, the circulation is slower, and free diuresis can be easily produced.

Not only do they act as valuable auxiliaries in the treatment of fever, but they actually in many instances prove curative without any other treatment. Thus we have seen disease completely broken up, by keeping up their influence for twenty-four or thirty-six hours; under their relaxing and sedative influence the secretions became free, and the system, relieved of the high degree of excitement, in this time freed itself of the materies morbi which produced and kept up the febrile reaction. Nor are we alone in believing them to be curative agents, for many have witnessed similar effects, and there are probably none who have used the two agents named, but what have noticed them in some instances.

Compare the action of such an agent with the *lancet*, the great sedative agent of some practitioners, and we will clearly see the difference between sedation, produced by a nerve medicine, and that produced by *exhausting the system of a fluid necessary to its existence.* In the one case, the effect is temporary, a *stoppage of nervous influence;* in the other, sedation is the result of *exhaustion*, produced by abstracting the nutritive fluid of the body.

II. *Action in Pneumonia.*—This class of agents are of especial importance in the treatment of acute inflammation of the lungs, for many reasons.

1st. They exert a marked control over the action of the heart, and by lessening its action they prevent the rapid influx of blood to the lungs, and thus prevent the progress of the inflammation. The greater the quantity of blood sent to them, the more dyspnœa must there be, the more venous blood passing into the arteries, as well as the more risk of effusion of lymph, and the obliteration of the cellular texture of the organ. If then we can arrest this determination, by the use of direct sedatives, which we can do, we arrest the main feature of the disease—in fact we stop the inflammatory action, and give the oppressed lungs time to recover from their morbid condition.

2d. They exert a direct action upon the pneumogastric nerve, calm its irritation, and through it exert a similar influence upon the inflamed tissue of the lung. By this action we diminish the sensation of *want of breath*, and thus do that for the lung which we do for the eye by darkening the room, or for an inflamed joint, when we prescribe absolute quiet—we do all we can to spare the exercise of the inflamed organ, which always aggravates the disease. By the same influence we check the harrassing cough, which invariably is accompanied with increased flow of blood to the lungs, and consequently increased congestion. The cough is checked, because the sensibility of the pneumogastric nerve is deadened, and it does not therefore convey to the brain the sensation of obstruction and irritation which exists in the lungs.

3d. They relax the entire system, and by lessening the rapidity of the circulation they relieve the excretory organs, and indirectly act as eliminatives. Thus, when the disease has arisen, as it may, from a morbid material in the circulation either introduced from without, or retained within the blood by the stoppage of an excretion, these agents produce that condition of the system that is favorable to its excretion.

From what has been said above, it will be evident that they are not only valuable as auxiliaries to other treatment, but they also act as direct curative agents. Especially is this the case in the first stage of the disease, for in this case they often stop the progress of the inflammation until the natural powers of the system remove the cause of the morbid process.

Indirect sedatives have long been used to fulfill the indications just described; thus we administer emetic agents in nauseant doses, to obtain their sedative effect upon the circulation, and because they diminish the sensibility of the lungs. By their use we prevent determination of blood to these organs, lessen their activity, check the cough, reduce the force and rapidity of the circulation, and produce general relaxation.

III. *Action in Chronic Diseases of the Respiratory Apparatus.*—This class of agents fulfill many indications in chronic diseases of the respiratory organs, in some cases being merely palliative, while in others they prove curative. In chronic bronchial inflammation and in phthisis pulmonalis, sedatives are valuable as palliatives, and even as curative agents. In these diseases, especially in the advanced stages, there is increased vascular action and nervous irritability, troublesome cough and hectic fever. The increased vascular activity, with the fixed irritation in the respiratory passages, keeps up an undue afflux of blood to the lungs, the presence of which, connected with the increased rapidity of circulation, tends to irritate and excite the diseased organs, and keep up and even aggravate the cough; while the cough, in return, serves to increase the general excitement and pulmonic inflammation and hectic fever. In such cases the great desideratum is to moderate the momentum of the circulation by the use of sedatives, and to lessen the nervous excitability and irritability of the lungs and general system. Sedatives abate the incessant cough, moderate the hectic fever, and prove important sanative agents in curable cases, and equally important as palliatives in cases of an incurable character.

They are also used with much advantage in asthma, pertussis, and certain catarrhal affections; they allay the irritation and resolve the spasm upon which the cough is dependent, and often effectually relieve the complaint.

IV. *Action in Inflammation of the Serous Membranes.*—In this class of diseases, the agents we are now considering exert a prompt and marked curative influence. Wherever we have inflammation of a serous membrane, as in peritonitis, pleuritis, etc., we have a far greater excitement of the vascular and nervous systems, than when any other tissue is affected. Sedatives directly remove this excitement, allay the pain, and lessen the action of the heart; and by their influence in this respect, they rapidly lessen the inflammatory action. "Inflammation," says Dr. Fergusson, "being made up of vascular and nervous action, of the afflux of blood to a part, and of pain, it is not irrational to act on both the elements of the malady at the same time, or in periods shortly consecutive of each other." By these agents we do act directly upon both; by lessening the force and frequency of the pulse, we check the vascular afflux to the inflamed part, and the medicine depresses the entire nervous system; we therefore strike directly at the foundation of the disease. Thus in peritonitis or pleuritis, by the administration of one of these agents, the veratrum viride, we may depress the action of the heart, lessen the pulse from 140 or 150 to 60 or 70 beats in the minute, relieve the severe pain, relax the system, promote the secretions, and by continuing the influence for twelve or twenty-four hours, the disease is entirely subdued.

In the first stages of puerperal peritonitis, or other forms of puerperal fever, they also exert a marked curative influence. In these cases it will not do to let the inflammation progress for twelve or twenty-four hours, while we are waiting for the action of the ordinary remedies. If we wish to cure our patient, it is necessary, in many instances, that the inflammatory process should be immediately arrested, or, at least, kept from progressing. Sedatives, in these cases, fulfill every indication; they check the afflux of blood to the inflamed part, lessen the fever, and quiet nervous irritability; and this influence we can continue as long as we may desire, by their use. If they do not prove curative in these cases, which we believe they do, they at least arrest the progress of the disease until we can influence the system with other agents.

V. *Action in Rheumatism.*—This class of agents have proved to be very valuable in that species of rheumatism termed *inflammatory*. Its action in a case of this kind may be accounted for in the same manner as in true inflammatory diseases; it reduces the action of the heart, and thus prevents the afflux of blood to the diseased part; it deadens the sensibilities of the nervous system, and it produces relaxation of the entire system, and free action of the excretory organs. In these diseases, however, they should always be combined with or followed by such agents as will eliminate from the system the morbid material that has produced and kept up the disease.

Their most marked influence, however, is observed in cases of metastasis of the rheumatism to the heart. In these cases the symptoms are always very alarming, and not without cause, for it is probably the only fatal form of rheumatism. The principal symptoms of the disease, rapid pulse, palpitation, pain in the region of the heart, and extending up to the shoulder, difficulty of respiration, etc., would indicate a condition in which these agents might be successfully employed. And we find that under their use we can control the circulation, remove the pain and other symptoms, and radically remove the disease.

VI. *Action in Disease of the Heart.*—In hypertrophy, or in dilatation of the heart, in aneurism of any of the large arteries, in palpitation of the heart, ossification of the coronary arteries, aorta, etc., or in cases of ossification of the valves of the heart, the more frequent the systole and diastole of the organ, the more anxiety and suffering will the patient experience. Hence the importance of sedatives to allay the irritation existing, and reduce the frequency of the heart's action.

They are also beneficial in angina pectoris, a disease that usually owes its origin to organic heart disease. It has been found that the surest preventive against this disease is to avoid every thing that will accelerate the circulation, as attacks of it can always be traced to either mental excitement or muscular exertion, which has caused an increased action of the heart. Sedatives, by exerting a direct control over this organ, will prevent the excitement by which the paroxysm is produced, and many authors regard this class of agents as the most appropriate in the treatment of the paroxysms. Thus Dr. Elliston recommends hydrocyanic acid as the best agent; others belladonna, stramonium, etc.

VII. *Topical Uses.*—We have already stated, that these *direct sedatives* would produce the same effect upon the nerves with which they are brought in contact, that they would upon the nervous system when absorbed and conveyed to the nerves by the circulation. They thus become very useful in neuralgia, by the topical application to the part affected. In facial neuralgia, for instance, we often observe marked benefit from the topical application of the aconite; in some instances of very intractable cases, success has been reported by making an incision, or incisions into the part affected, and injecting the sedative agents into the wounds, bringing them into direct contact with the nervous trunks.

They are also used as topical agents in some conditions of the stomach. Thus, in nausea and efforts to vomit, arising from an irritation of the stomach, and not dependent upon morbid accumulation in it, sedatives calm the irritation, check the nausea, and stop the retching. In gastrodynia, pain or spasm of the bowels, or other local neuralgic affections, sedatives often give prompt and lasting relief.

RECAPITULATION.

1st. Sedatives are agents that act directly upon the nervous system, and depress nervous force; their action is directly opposite to that of stimulants, and as they act upon the nerves their action is transient.

2d. They are useful in all diseases of an acute character, attended with acceleration of the pulse, from their marked effect in controlling the action of the heart.

3d. They are employed in fever, to lessen the action of the heart, lessen nervous irritability, and produce relaxation; by this influence they often prove curative agents.

4th. They prove beneficial in pneumonia, by lessening the action of the heart, thus directly relieving the engorged lungs; by deadening the sensibility of the pneumogastric nerve, thus allaying cough, irritation and increased activity of these organs; by relaxing the entire system they equalize the circulation and promote secretion.

5th. They prove valuable in chronic disease of the respiratory organs, by lessening the irritation, checking the cough, and lessening the action of the heart.

6th. They are important curative agents, in the treatment of inflammation of the serous membranes, by directly controling the essential parts of the process of inflammation, circulation and innervation.

7th. They are used with advantage in rheumatism, for the reasons above named; but they are of especial importance in this disease when it affects the heart, as by their use we may control the excitement of this organ. They are also important agents in the treatment of all diseases of the heart,—angina pectoris, aneurisms, etc.,—from the same reason.

8th. Their topical use is often beneficial in local neuralgic affections, gastrodynia, etc., as they exert the same effect upon the nerves of a part when applied locally, that they do upon the general nervous system, when conveyed to it by means of the circulation.

CLASS VI.

NARCOTICS.

NARCOTICS may be defined to be agents which lessen the sensibility and irritability of the nervous system. They first act as excitants to the nervous and vascular systems, and secondarily, as sedatives to the sensorial and vital powers; and if given in suitable doses, they produce torpidity of all the functions, insensibility and sleep. The encephalon, and its appendages, it would seem, are the parts upon which the influence of narcotics are principally expended.

Narcotic and sedative are generally considered as synonymous terms, and the general opinion is, that a narcotic agent is sedative, and vice versa. It is true, that most of the narcotics are sedative—their secondary influence being that of sedation. On the contrary, many articles having no narcotic property, and rarely if ever used as such, are commonly classed with narcotics, as digitalis, veratrum viride, lycopus, etc.; and again many therapeutic agents, used as sedatives, are never classed with narcotics, as nauseants, kalmia latifolia, prussic acid, prunus virginiana, the lancet, tartrate of antimony, etc. From these considerations it will appear that, at present, no well-marked line of separation between the two classes of agents commonly denominated narcotic and sedative, exists; and yet we think there is sufficient difference in their therapeutic action and applicability, to warrant a distinction, notwithstanding the same articles, many of them, may possess properties, and fulfill indications common to both. As has already been intimated, the principal difference between the two classes, consists in the *primary excitation* consequent on the administration of narcotics — the secondary effects in both cases are quite similar. Sedatives, however, do not possess the anodyne, or soporific properties which characterize narcotics, and consequently are adapted to the fulfillment of somewhat different indications in the treatment of disease. The latter are administered as anodynes and hypnotics; they alleviate pain, allay nervous irritation, counteract spasm and procure rest; while true sedatives are administered to subdue preternatural excitement, to abate excessive or exhausting organic movements, and to counteract excessive vascular action.

Action of Narcotics.—All narcotic agents are soluble in the fluids of the body, and hence they are readily absorbed; some of them are very soluble, and their absorption is immediate; hence they act very rapidly. The remedy after being absorbed is conveyed by the circulation to the nervous centers, and produces its specific effect upon them. Why a certain agent will act as a narcotic, and what effect it has upon the nervous system is not known, and probably never will be; we therefore have to be satisfied with a knowledge of the symptoms it produces. That this class of agents are absorbed, and are carried by the blood to the part on which they tend to act, has been proved beyond a doubt. Thus those agents will produce their specific effects when absorbed from any part of the system, or when injected into the veins. Another evidence that they are absorbed into, and act from the circulation, is the celerity with which they produce their narcotic effects when applied locally. Opium, for instance, when applied to ulcers produces costiveness, headache, nausea, etc., and in short, the endermic or topical application of it is followed with the same unpleasant symptoms that attend its internal exhibition.

The attempts to ascertain the locality upon which these agents act, has not thus far been attended with much success. Flourens was of the opinion that opium acted specifically upon the cerebral lobes; that belladonna, when the dose was small, acted upon the tubercula quadrigemina, and in large doses upon the cerebral lobes also, etc. These opinions were founded entirely upon the symptoms produced by the agent, and not by any pathological change in the part supposed to be acted upon.

Narcotics also act directly upon the nerves of the part with which they are brought in contact. Thus when taken internally they prove topically sedative to the nerves of the stomach, and are often thus used to relieve the pain in gastrodynia, to allay the excitement and irritation of the gastric nerves in nausea and vomiting, etc. When taken before eating they often lessen the appetite, and may even destroy it by lessening the gastric innervation; for the same reason they retard the process of digestion—chymification, chylification and defecation may be arrested by the paralyzing influence of the narcotic.

The first sensible influence of narcotics upon the system, when administered in either excitant or sedative doses, is an increase in the activity of the circulation and cerebral functions:—the force and rapidity of the pulse is augmented, the skin becomes hotter and drier, and there is increased mental and physical activity. They produce vivacity, a lively imagination, quicken the perceptive faculties, and give muscular vigor and courage. If, however, the agent is administered in doses sufficiently large, the excitement will be of short duration, and the anodyne and soporific effect will be more intense and continue longer. The relative intensity of these primary and secondary effects varies in the different narcotics, and even in the same narcotic in different doses. If the dose is large, heaviness of the head, dullness of the intellectual faculties, dimness of sight, muscular weakness, diminution of the motor power, prostration and loss of energy, and a tendency to coma are the results. In some cases vertigo, cephalalgia, convulsions, hallucinations, total loss of the mental faculties,—and if the dose of the narcotic is sufficiently powerful,—a profound coma ensues; the pulse is full, slow and laboring; the respiration slow and stertorous; in a few hours the skin becomes cool and clammy, and the extremities cold; the pulse is feeble and threadlike, and death follows. Death is supposed to result from deficient innervation of the respiratory organs; the narcotic overpowers the brain and nervous system, due innervation is not transmitted to the respiratory apparatus, there is not sufficient aëration of the blood, and the patient dies asphyxiated.

Notwithstanding the deadly effects which they occasionally produce, when injudiciously taken, they can be used in suitable quantities to secure their anodyne and hypnotic influence with as much safety and certainty of success, as emetics or cathartics, in the various cases in which they are prescribed.

The modus operandi of each narcotic seems to be peculiar to itself; each seems to exert an influence over the sensibilities of the system, in some particulars different from any other. Thus, after one has failed to induce sleep, complete success will often attend the administration of another; and here lies the great advantage of having recourse to a variety of different agents whose general properties are the same.

THERAPEUTIC INDICATIONS.

By the sedative influence of narcotics upon the nervous system, their general tendency is to lessen the secretions of the different organs, as the liver, kidneys, mucous secretions, etc., when the parts are in a normal state; hence they produce constipation, by lessening the secretions poured into the bowels, and by deadening their sensibility and lessening their peristaltic action. It is true there are exceptions to this general rule, for some of the agents of this class promote instead of retarding the secretions; while others which lessen them in a healthy or normal state of the organs, often restore them when diminished or arrested. In opposite pathological states of the same organ, when the secretion is either diminished or excessive, they often restrain it when too profuse, and promote it when scanty, and thus exert a marked control over the secretions. When speaking of opium we shall endeavor to illustrate this peculiar action, and the proper therapeutic application of this class of agents to such cases.

The three principal indications which the physician wishes to accomplish by the administration of narcotics, are the *alleviation of pain*, the *production of sleep*, and the *relief of spasm*. As antispasmodics their utility is dependent upon their anodyne properties. There is one circumstance connected with the administration of narcotics as anodynes or hypnotics which deserves a passing notice. The physician is often disappointed when he prescribes them as soporifics, when most desirous of securing repose to his exhausted and tortured patient. The disappointment springs from administering the agent in excitant, and not in sedative doses. If administered in doses not large enough to secure sleep, it augments the excitement, and maintains wakefulness, and often begets a morbid vigilance. If the dose is increased, the nervous and vascular excitement, the excessive organic action and pain are alleviated, and all care and anxiety subside; the morbid sympathies are arrested, the mental and physical turmoil ceases, and the patient falls into a calm and comfortable state of repose, to awake invigorated and refreshed.

Those who clamor so vehemently against the use of narcotics, and offer as substitutes "*relaxants, nervines* and *antispasmodics*," deprive themselves of an invaluable class of medicines without pointing out, or being able to point out real substitutes; they have no medicines with which they can produce the same happy and very desirable influences.

If the disease in which narcotics are administered is of a protracted character, and the frequent and long-continued use of them becomes necessary, the dose will require to be augmented. The system gradually, and with more certainty loses its susceptibility to this class of agents than any other; and hence the necessity of duly increasing the dose.

With regard to their therapeutic application to particular diseases, much might be said, but we will omit many points until we come to the description of particular agents of this class. They are adapted to certain stages of almost all diseases; sometimes they are prescribed as independent curative agents, but more frequently as auxiliaries, and not unfrequently, simply as palliatives.

I. *Action in Diseases of the Lungs.*—Opposite opinions obtain relative to the use of narcotics, and particularly with regard to the use of opium (which, in some respects, is sui generis), in the various forms of pulmonic inflammation, because it is said to arrest the mucous secretions; but it would seem that the objection to the use of this article, either in the primary or secondary forms of this class of diseases, is not founded upon a proper understanding of the pathological changes which follow from its use, or which take place spontaneously as the disease advances. During the early stages of pneumonia and bronchitis, the acute inflammatory action either arrests or greatly diminishes the normal secretions; the suppression being due to the pathological condition of the mucous membrane. In such cases small doses of opium would increase the intensity of the inflammation as readily as any other excitant; and if the secretion was not arrested, but only diminished, it would entirely arrest it by its excitant influence upon the system. Now, if given in sedative doses, it will change the pathological condition which caused the arrest of the secretion; nauseating expectorants combined with it would render it doubly valuable. In sedative doses its influences would be reversed; it would lessen the intense inflammatory action which caused the diminution or arrest of the secretion, and thereby contribute to its restoration.

In the advanced stages of the acute form of the above diseases, or in their chronic form, the pathological condition of the inflamed parts has materially changed since the acute inflammation existed; which change is characterized by an increased or profuse morbid secretion from the mucous membrane. In this case it will diminish the secretion, by diminishing the inflammation upon which the increased secretion is dependent; thus they may be said to promote it in the first case, and diminish it in the second.

In the last stages of phthisis pulmonalis, in many cases, the administration of narcotics is an act of mercy, smoothing the sufferer's pathway to the grave. They lessen the irritability of the lungs, check the harrassing cough, relieve the pain, check colliquative diarrhea, and in this way not only prolong life, but make the last days of the patient, if not easy, endurable.

II. *Action in Diseases of the Stomach and Bowels.*—In gastrodynia narcotics are valuable for their topical influence upon the nerves of the stomach; they often produce a local torpor of these nerves, and thus relieve the severe pain. In irritability of the stomach producing continued nausea and vomiting small portions of morphia will allay this irritation, and check nausea and vomiting without producing any sensible effect upon the general system. The same agent is often employed in very minute doses in combination with demulcents in acute gastritis, and with marked success.

In peritoneal enteritis there is a concentration of morbid sensibility and irritability, connected with excited organic action in the peritoneal and muscular coats of the bowels;

the tension of the parts, owing to the active inflammation, approaches a spasm. This concentration of vital organic action in the exterior coat of the bowels, acts as a derivative to the mucous membrane, and thus its secretion is diminished, and the combined influences often produce obstinate constipation. Opium, by its contra-stimulant power, lessens the inflammatory action and morbid sensibility, restores the secretions, removes the spasm, and may act indirectly as an aperient, and even aid the action of cathartics.

The same narcotic is administered in another form of inflammation, both to restore and restrain the secretions and excretions. In diarrhea, we have an inflammation of the mucous coat of the intestines, with augmented secretion soon after the attack, and with frequent alvine evacuations, owing to increased peristaltic action. Opium lessens the undue activity of the bowels, and their morbid sensibility; it tends to arrest the inflammation by its contra-stimulant powers, changes the pathological character of the disease, and diminishes the secretions; and thus acts indirectly as an astringent.

The same article in the two cases just referred to, exerts the same influence in each, yet owing to the opposite pathological conditions existing in the two cases, the results vary. In the first instance the secretion is increased, and a laxative influence produced; in the second, the secretion is diminished, and constipation follows.

For the same reason that opium is so valuable in peritoneal enteritis, it is also valuable in that painful affection, colica pictonum, and in nervous and spasmodic colic. In these cases there is a diminution of the secretions, a violent tension, or even spasm of the muscular coat, obstinate constipation, etc., attended with violent pain. In such a case, a sedative dose of opium allays the pain, resolves the spasm, promotes the secretions, and facilitates the action of cathartics.

III. *Action in Fevers.*—In febrile and inflammatory diseases they are valuable as anodynes, as sedatives, and as diaphoretics. As anodynes they are very beneficial in relieving pain and subduing nervous irritability, which very frequently greatly aggravate the disease. As sedatives or hypnotics, they induce sleep, and thus directly sustain the strength, by calming the existing excitement, and allowing that repose which nature demands; they also prevent, according to some authors, the rapid oxydation which is taking place in these diseases. By subduing exalted organic action, overcoming the tension of the muscular system, and removing cutaneous spasm, they prove highly antiphlogistic, and valuable auxiliaries to nauseants, diaphoretics and refrigerants.

IV. *Action in Local Diseases.*—A local injury or a morbid exaltation of organic action of a local character, from whatever cause it may arise, very often produces general disease, and not unfrequently destroys the patient, from the severe pain and nervous irritability which it induces. Thus a burn, bruise, or abrasion of parts, a painful tumor, boils, felons, irritable ulcers, white swellings, gout, rheumatism, etc., by their high grade of local excitement, may involve the whole system in a general diseased state, through the sympathetic irritation which it produces in all parts of the system. From a wound or an injury done to a nerve, as by the thrust of a nail, thorn, or any sharp instrument, at any season of the year, but especially during the hot season, when there is increased irritability and excitability of the nervous system, that formidable disease, tetanus, not unfrequently results. In such cases a sedative dose of a suitable narcotic, together with the topical application of a similar agent, lessens the impressibility of the nervous system in general, and the nerves involved in particular, and prevents the cerebro-spinal centers from appreciating the local injury, until suitable means can be adopted to allay the local irritation, and prevent the morbid effects upon the entire system.

In numerous cases of both local and general disease, the induction of sleep by the use of narcotics, which at the same time are capable of allaying pain and excessive vascular and nervous excitement, so prejudicial to recovery, and even destructive to the life of the patient, if permitted to continue long unabated, is of the utmost importance. In cases of violent neuralgic pain, arising from loss of blood, and not dependent upon vascular repletion or cerebral inflammation, a sedative dose of opium will speedily alleviate the pain, and subdue the vascular excitement.

In cancerous, scrofulous and syphilitic diseases, where there is much irritation, pain and general excitement, they will prove valuable palliatives, and may, as auxiliary agents, exert a salutary curative influence. In incurable cancer, where the pain is severe, and the repose of the sufferer thereby interrupted, they afford great relief by allowing repose, and invigorate the system by securing a temporary respite from the protracted torture.

Narcotics are very important as topical agents, in painful scirrhus, or scrofulous tumors, hernia humoralis, nodes, buboes, or in any local or painful inflammatory affection. The sedative and anodyne influence of narcotics in the form of poultices, liniments, ointments, etc., renders them valuable therapeutic agents. They lessen the pain by their sedative, anodyne and emollient influence, and prove exceedingly valuable as discutients, if the suppurative process is not too far advanced. If there is no chance for discussion, they will advance suppuration.

In cases of cancer of the uterus, bladder or rectum, in cases of hemorrhoids, or any painful and irritated condition of those parts, narcotics are occasionally used with much advantage as palliatives, and not unfrequently prove beneficial as curative agents. They may be used in the form of injections, ointments, etc.

They are of great importance in the various spasmodic diseases. As anodynes they calm and allay that morbid erythism of the nervous system, and the inordinate organic action upon which spasm depends.

Their value is very considerable in neuropathic diseases; in all the numerous forms of which, as mania, hysteria, delirium tremens, etc., narcotics occasionally procure more or less relief.

In many cases of troublesome cough, occurring during the cold and variable season of the year, and arising from an irritation of the pneumogastric nerves, distributed to the mucous membrane of the air-passages, and not dependent upon an inflammation, narcotics, particularly opium, or morphine and its salts, will allay the irritation, and check the tickling cough, generally very promptly.

CONDITIONS CONTRAINDICATING THEIR USE.

Narcotics are contraindicated in cases of extreme debility; unless they are of a stimulant character, and administered in stimulant doses, or in combination with stimulants. They are also objectionable in encephalitis, and in paralysis, unless it is connected with, or dependent upon some local irritation or inflammation; when if other symptoms seem to demand their employment, they may be used.

Notwithstanding the numerous cases in which they are used, and the immense advantage gained by their employment, yet it must be confessed that their long-continued use is prejudicial to the well-being of the patient; for their general tendency is to destroy the functions of the nervous system. The same remarks, however, will apply with much force to the constant and continued use of medicinal agents generally. It must be borne in mind, that medicines are but so many necessary evils, imperiously demanded in certain morbid states of the system, but useless, and even positively pernicious in a state of health.

RECAPITULATION.

1st. They are administered as anodynes in cases of inordinate and excessive pain.

2d. They are prescribed in various acute diseases, attended with morbid vigilance, as hypnotics—or with a view to the production of sleep.

3d. They are useful as antispasmodics; in spasm of any part they are used with advantage, from the fact that they diminish innervation, as well of the motor as of the sensitive nerves.

4th. They are administered as sedatives in febrile and inflammatory diseases, to allay exalted organic action, as well as to alleviate pain; they are also administered, to secure their diaphoretic influence, either alone or in combination with other agents; also as stimulants, when given in small doses, in the advanced stages of fever.

5th. In cases of acute pneumonia they are administered in sedative doses, to restore the pulmonary secretion.

6th. During the secondary stage of pulmonic inflammation, when the secretions are profuse, they are administered to check them.

7th. In acute inflammation of the mucous membrane of the bowels, they arrest the secretion, lessen the pain and increased peristaltic action, upon which the frequent purging depends.

8th. In cases of colica pictonum, or peritoneal enteritis, they allay the pain, resolve the spasm, and facilitate the action of cathartics.

9th. In injury of a nerve, or excessive local pain, they prevent the brain from appreciating the local lesion and pain, until suitable local applications can be made, and the morbid sensibilities lessened; and thus prevent general disease, and often save the life of the patient.

10th. In irritation of the pneumogastric nerve, attended with a severe cough, in irritation of the mucous membrane of the stomach attended with nausea and vomiting, they often give prompt and speedy relief.

11th. In the various forms of neurosis, they are used as sedatives, anodynes, and antispasmodics.

12th. In cases of incurable cancer, and other incurable diseases, they are resorted to as palliatives, relieving the pain, procuring sleep, and making the last days of the patient more comfortable.

13th. As topical applications in scirrhus, scrofulous and all painful tumors, painful and irritable ulcers, hemorrhoids, cancer of the uterus, etc., they are important as local anodynes, discutients and emollients.

CLASS VII.

STIMULANTS.

STIMULANTS are medicines which produce a temporary increase of one or more of the vital functions. A much more comprehensive signification is often given to this word; thus, the true stimulant, the astringent and tonic, are distinguished as general stimulants, while emetics, cathartics, diaphoretics, diuretics, emmenagogues, sialagogues, errhines, parturients, etc., are termed local stimulants. In this sense every medicine is a stimulant, not excepting, according to many authors, even "*sedatives.*"

But it is not in this wide and indefinite sense that the word can with propriety be used in the classification of remedial agents. The term *stimulant* or *excitant* is here applied to those medicines which produce a temporary increase of the action of the heart and arteries, and in the supply of nervous energy, without any sensible increase in the evacuations or secretions.

The first effects of narcotics are those of stimulation, yet we do not consider them as true stimulants. Many agents, however, which we have classed as stimulants, after exerting their stimulant effect, are followed by nervous depression or sedation; as the alcoholic liquors, etc.

It must be admitted that many of the different classes of remedial agents glide by an indefinable gradation into each other, and partake of the properties common to other classes. It will also be recollected that numerous articles of the materia medica are possessed of a variety of different properties, —thus we often have an agent possessed of stimulant, diaphoretic, diuretic, expectorant and purgative properties. From these remarks it must be apparent to all that our present classification is erroneous, or at least not based upon an unobjectionable foundation. We shall, however, pursue the beaten track, acknowledging at the same time our inability to confine particular medicines to the respective classes under which they may be technically ranked.

Action of Stimulants.—Stimulants belong to the class of *neurotic* medicines; that is, they act upon the nerves, and as we have already seen, the action of such remedies is transient. The question has been much discussed, whether stimulants really *exalt* nervous force (increase its quantity), or whether they merely call it forth (expend that which already exists). We are led to believe that stimulants really increase the amount of nervous force; for if they did not, we would always have as a result of their use a depression corresponding with the primary excitation—which is not the case. Again, we may maintain a certain degree of stimulation for an indefinite period by continuing the use of the remedy, which we could not do, if they merely expended nervous force without causing a reproduction of it.

We must, however, carefully distinguish between *nervous* and *vital* force; for nervous force may exist in excess, when the vital force or that power which preserves life, is depressed. "Nervous force," says Headland, "may be very much increased, as in high inflammatory fever, without a corresponding increase of the vital. The advantage of a stimulant is regulated by this rule.—When there is a failure in vital energy, no stimulant will serve to prolong life, for it can not communicate fresh vital power. But there may be no such failure of vital energy, and yet a sudden or accidental deficiency of nervous force may serve to peril the continuance of health, or even the tenure of life. For a certain degree of this nervous force is necessary both for life and health. When it is diminished, all the functions must suffer! when it fails entirely, the circulation must stop and death ensues. It is in these cases that a stimulant medicine is appropriate. It does not do good by communicating vital energy, but by remedying the want of nervous action, by which want the manifestation of the vital energy is subdued. This must always be borne in mind when the applicability of stimulants is under consideration."

The first effect of a stimulant is that of a topical excitant. When taken into the stomach, they stimulate the mucous membrane to increased secretion, and the muscular fibers to greater activity; the food is more readily and rapidly digested, and chylosis facilitated. This local stimulating influence is transmitted to every portion of the body by sympathy, and the whole system participates in the excitation.

All stimulating agents are soluble in the fluids of the body, and are hence absorbed into the circulation, and by it brought into contact with the entire nervous system. These agents, as we have already noticed, prove stimulant to any nerve with which they are brought into contact; thus we have the topical stimulation of the stomach, the topical stimulation when applied to the skin, etc. We thus see that they act directly on nerve-matter, whenever brought in contact with it; and through the circulation they are brought into direct contact with the entire nervous matter of the body. As the result of this, the contractions of the heart are increased in force and frequency, the pulse becomes more energetic and frequent, respiration is accelerated, animal heat augmented, the countenance is enlivened, the intellectual and physical powers increased, and the cutaneous and renal secretions exhibit increased activity. They produce a temporary exhilaration of mind, revive and elevate the spirits—in a word, the phenomena of health are active when the system is under their influence, unless overpowered by disease. In some cases the excitation, when carried too far, or too long continued, may result in febrile or inflammatory action. The super-excitation which follows their too free use, often results in prostration, though this is not always proportioned to the intensity of the previous excitement.

As has been already remarked, many stimulants exert an especial influence over particular secretions, or over particular organs. Thus the carbonate of ammonia is diaphoretic as well as stimulant; the cantharides and juniper diuretic; while the turpentine, gum-resins, copaiba, benzoic acid, etc., though stimulants, exert an especial influence upon the mucous membranes, diminishing excessive secretion — and especially is this the case with the genito-urinary mucous membrane.

Those agents, generally denominated *tetanics*, or muscular stimulants, as the strychnia and brucia, are peculiar agents.

whose excitant influence appears to be exerted upon the motor column of the spinal cord, the motor parts of the brain, and the motor nerves. Thus, in large doses, they cause spasmodic and powerful contractions of the muscles of the body, and they may even produce death in this way, by rendering respiration impossible. In order that these agents should produce their specific effect, two things are necessary: first, that the muscles to be acted upon should be in a normal condition; and second, that the nerves passing from the nervous centers to them must be sound, so as to afford a medium for the passage of the increased nervous current. It is proved that they act upon the nerves, and not upon the muscles, by the fact, that when the nerves are injured, so that they can not convey an impression, these agents have no effect upon the muscles, though every other condition is present.

As has been before stated, the moderate use of stimulants renders digestion more rapid and more perfect, the circulation is more vigorous, and its centripetal or congestive tendency is superseded by the centrifugal, and all the secretions are facilitated. But if they are too freely used, if the dose is large and too often repeated, or administered with any great degree of persistence, their sanative powers are lost, and they become engines of disease. If too freely employed, irritation, or even inflammation may supervene in the organ with which they come in direct contact—or in a neighboring one, and symptomatic fever may result; under which many of the functions instead of being promoted by the stimulant, will be retarded. This is the case with the secretions and excretions generally — they are always deranged during febrile excitement.

Another result follows from exalted organic action, whether it depends upon artificial stimulation, or is the result of disease; that is, the exalted action is always followed by depression to a greater or less extent. This is the case with either mental or physical excitement, prostration being always the result of it, when carried to an extreme. Prostration is always the more marked the greater the stimulation. To a certain point stimulation may be carried without subsequent prostration; but passing beyond this point, we may say that it is proportioned to the amount of stimulation.

If one organ is over-excited in any way, some other organ is apt to become equally depressed, or to take on a state of inactivity, atony or debility. We frequently meet with cases of extreme debility of an organ, or of the general system, when the debility is apparent, but not real, some other organ being over-excited, thereby causing the apparent prostration. This is often a nice point to determine in the progress of disease, and one upon which the most expert diagnostician will sometimes err. When the prostration is but apparent, and depends upon some local and deep-seated congestion or inflammation, which is oppressive to the vital powers, a course of depletive medication, instead of increasing the debility, will often increase the strength, by removing the congestion or cause of oppression, and apparent debility: whereas, if the debility had been real, the same mode of medication would have destroyed the patient.

The morbid condition, atony or debility of one organ induced by over-excitement of another, arise from the withdrawal of the due nervous impressibility and diminished vascular stimulus from the atonic organ, by its concentration upon the one undergoing the undue and artificial stimulation. There are numerous cases in which excitants are of great importance, yet the extent of excitation indicated in disease, is a matter of interest to the physician as well as to the patient; for it must be confessed, the general tendency of the too free and protracted use of this class of agents is to impair the vital energies of the general system, when general stimulants are used, or of particular organs, when special ones are used, and finally, to wear out the natural sensibility and excitability of the organ, or even the whole system.

It may be asserted, we think, as an axiom, which can not be controverted, that *super-excitation* in a single organ, or in the whole system, whether it is dependent upon excrementitious matter retained in the system, and acting as a source of irritation, or is the result of incessant heating or stimulating medication, is always compensated for by a corresponding loss of action in some other organ or organs, or even in the entire system, and ultimately, with a diminution of the activity, or even the entire loss of the functions of the organ upon which this super-excitation or undue stimulation has been made.

From the foregoing remarks, it must appear evident that the long-continued use of stimulants of a hot and very exciting character, must be attended with great injury. There are some classes of physicians who make the stomach the great theater of therapeutic action—the organ which is made to receive the major part of all their impressions, and the one upon which the nervous and vascular action is concentrated by the unbalancing weight of their whole mode of medication. This organ is first distended and relaxed by enormous quantities of hot fluid, strongly charged with capsicum, or the "composition powder," which renders it the great central organ of sympathies, a center of fluxion,—one upon which the vital energies are concentrated, while other organs are deprived of their ordinary vital afflux by the abstraction or destruction of the equilibrium just referred to. These pungent, acrid, heating medicines acting upon this relaxed and now morbidly sensitive organ, and followed up for from six to twelve hours, and repeated daily for weeks, and even months, sometimes until "*three hundred courses*" of the kind are gone through with, can not fail to debilitate the stomach and wear out its natural sensibilities, and produce those of an abnormal character, together with an irritation and thickening of the mucous coat, and a permanent chronic phlogosis. In this way the normal sensibility of the stomach is blunted, and often destroyed; while other organs lack innervation from the undue concentration which has there taken place. Chronic gastritis and dyspepsia are two very common forms of disease which result from the repeated and long-continued use of these pungent acrid excitants. The skin is another tissue upon which they act so frequently, and with such vehemence, that they often destroy its normal functions and produce a state of innervation, or loss of vital energy, incompatible with a state of health in other organs or parts of the system.

We do not deny that these measures are capable of exerting a very powerful influence over many morbid and diseased states of the system; on the contrary, we know that this is the case. We also admit that, through these influences, the functions of many other organs are frequently restored or improved; but we object to this course of medication, because the great burden of removing disease is imposed upon one or two organs. Instead of dividing the influences, and throwing the burden alternately upon different organs and emunctories, one or two are made to perform the eliminating functions which should fall upon all.

Another class of physicians pursue a very different mode of medication, and one that unbalances the normal conditions of particular organs, as well as the general system, and proves far more detrimental to the unfortunate victims upon whom its blighting influences are exerted, than the once popular "course" just alluded to.

It has been the practice with these physicians to administer mercury in all diseases to which man is heir, for the purpose of stimulating the liver to increased secretion, and through the diseased condition of this viscus, thus produced, remove the disease. Nothing could be more absurd than such practice; for in the normal condition of the system, this secretion is not formed for elimination, but to answer a further purpose in the economy. Though mercury, at this day, is almost entirely discarded by the better informed, yet it is still made the great therapeutic lever by a large class of routine practitioners; while that important gland, the liver, is made the fulcrum upon which their principal curative means are used. With this weapon of destruction they enter the arena of life and death, too often to insure victory to the latter, or to render the constitution a wreck, and the survivor the subject of the physician's care through life. If called to treat a disease, either acute or chronic, symptomatic or idiopathic, neuropathic or asthmatic, febrile or inflammatory, anemia or plethora, dropsy or excessive excretion, such a physician fancies the liver is torpid, and is suffering from some functional derangement or organic lesion. Indeed it matters not what the case may be, that organ is the one which must take on itself the great burden of throwing off the disease. Should it not speedily succeed in doing so, the salivary glands and gums must next receive especial attention. The gums must be "*touched*," and the glands abnormally stimulated, in order to subvert the original diseased condition, by setting up a new and abnormal action in the system, counteracting the original one by substituting its own. To act upon the liver, remove its torpor, increase and regulate its secretions, restrain them if excessive, render them healthy if unhealthy, etc., etc., appears to constitute in the minds of mercurialists the great therapeutic indications to be fulfilled.

As has been before stated, by stimulating one organ, and making it the point of undue excitation, either general or local irritation may supervene, fever may follow, other organs be rendered torpid or debilitated, and this undue stimulation not unfrequently wears out or greatly impairs the liver, if it does not destroy life itself. The continued excitement of this organ by such treatment is one of the most prolific sources of chronic hepatitis, torpor or derangement of that organ, that can be named; indeed, we may safely say that this one agent, so often used, and so entirely depended upon to remove all hepatic derangements, causes more of the identical diseases which it is so often given to remove, than the sum total of all other agencies. The use of mercury to fulfill the indications referred to, is doubtless one of the greatest fallacies of the dominant practice of the nineteenth century, and one which in a future day, and that by no means a distant one, will be viewed as one of the most marvelous and visionary practices that ever obtained countenance from the great mass of the medical profession. Happily even now the more candid professors and practitioners confess that the liver is an organ "*more sinned against than sinning.*".

It is scarcely necessary to refer to the effects of alcohol as a stimulant, as they are known to all. It is an agent capable of doing a great amount of good when judiciously taken, "*in disease*"; but if too freely and too frequently used, and its use persisted in for any considerable length of time, it is capable of doing a more than equal amount of injury. The excitement which it causes in the system is followed by a corresponding loss of action. It produces enervation, atony or debility of some organs, while others are unduly excited; which excitation is succeeded by irritation, chronic inflammation, ulceration, and a thickening of the mucous membrane of the stomach; and finally by an entire loss of its natural sensibilities and functions. Visceral obstructions, dropsies, torpor of the glandular system, phrenitis, apoplexy, etc., are but so many pathological states of the system induced by undue and improper stimulation. All modes of stimulation, if carried beyond a certain point, result in a morbid over-excitement of the organ acted upon, and finally eventuate in the entire loss of its normal sensibility.

THERAPEUTIC INDICATIONS.

In *atonic states of the stomach*, when the mucous and muscular coats have lost their tone, when the food taken produces oppression, when there is flatulence, acid eructations, and the general evidences of dyspepsia, excitants become valuable. If the disease is transient, and arises from previous over-excitement which has produced a temporary exhaustion, ether, alcohol, wine, the essential oils, capsicum, aromatics, etc., may palliate, or even give entire relief. In the flatulent colic of children, aromatic excitants sometimes give prompt and speedy relief. If, however, these symptoms are protracted, we may rest assured that it is not a mere temporary loss of nervous energy, but a more permanent disease, in which agents more permanent in their influence upon the system, are demanded. In such cases, excitants combined with tonics comprise our most efficient curative means; gentle stimulation arouses the torpid gastric sensibilities to the influence of tonics, which impart permanent tone to the organ, and often restore it to its normal state.

In *violent spasm of the stomach or bowels*, dependent upon the translation of gouty irritation to these parts, unattended with inflammation, the most diffusible stimulants, either alone or combined with narcotics, are of great importance; external excitants or revellents to the epigastric region are also useful. These combined influences diminish the erythism of the nerves implicated, and frequently give relief.

In *constipation*, not attended with inflammation, excitants combined with cathartics often prove valuable auxiliaries, by stimulating the muscular coat, and thus quickening the peristaltic action of the bowels, facilitating the action of the cathartic. They are also valuable as correctors of cathartic medicines, as they prevent griping. The use of excitants in cases of nausea and vomiting, arising from pregnancy, hardly fails to palliate, and not unfrequently entirely removes these unpleasant symptoms.

Stimulants are important in the *advanced stages of febrile and inflammatory disease*, when a high grade of excitement no longer exists; even when the prostration is not great, if the arterial excitement is not very vigorous, the moderate use of stimulants will often hasten the progress of convalescence. In fevers of an adynamic type, when the prostration is great and the vital powers are apparently nearly exhausted or rapidly sinking, the pulse feeble and thread-like, a cold, clammy sweat, etc., active, diffusible stimulants of the most powerful kind become an indispensable part of the medication—their external employment is also demanded. In typhus and typhoid fevers, where the system is prostrated by the vitiated character of the circulating fluids, and a tendency to putrescence, great advantage is derived from the use of stimulants, either alone or in combination with tonics.

In *passive dropsies*, as auxiliaries to diuretics, they often exert a salutary influence. By their stimulating and exciting powers they impart new vigor to the atonic vessels, and thus counteract exudation.

The same remarks apply to their use in *passive hemorrhages*, indicating great prostration of the vital powers, and in petechia arising from the passive transudation of the diseased and dissolved blood, through the relaxed parietes of the atonic vessels. These hemorrhages are of frequent occurrence in adynamic fevers, typhus, typhoid, and other malignant and putrid fevers, scorbutis, etc.; in which cases the local revellent influence of an active excitant, as the capsicum, together with the increased vital energy which it imparts to the atonic vessels, recommend them to our use.

In *general debility*, torpor or languor of the system, when the circulation is sluggish, in the atony of old persons, and enfeebled and enervated states of the system which occasionally occur in both the old and the young, or which arise as secondary results of other diseases, excitants, alone or conjoined with tonics, are the therapeutic agents upon which our main reliance must be placed.

Paralysis is a disease of the nervous system, in which stimulants, both as internal and external agents, may be used with a prospect of advantage. When, however, the paralytic affection arises from a lesion of the cerebro-spinal axis, congestion or inflammation of those parts, this class of agents are contraïndicated.

A gentle excitant in *hysteria*, may sometimes be used with much advantage; a combination with antispasmodics increases their value. In other nervous affections, palpitation of the heart, headache, delirium tremens, and in all cases where there is either a permanent or transient depression of the vital powers, the diffusible stimulants, as camphor, wine, ammonia, etc., may be used as palliatives, or in some cases as curative agents.

Aromatics are spoken of by some authors as a distinct class of excitants or stimulants, but a distinction of this character is wholly uncalled for. They may be defined to be stimulants possessing a very fragrant or agreeable odor, and which when masticated or taken into the mouth, impart a sensation of warmth and pungency to the taste. Many of these aromatic stimulants are also tonic and astringent.

These medicines are also termed *carminatives*, and are employed very frequently to remove flatus from the stomach and bowels; but this effect depends wholly upon their local excitant influence upon the mucous membrane of the stomach and bowels, and the transmission of that impression to the contiguous muscular coat, from the action of which the expulsion or diffusion of the flatus takes place, and relief follows.

If flatus accumulates in the alimentary canal, the muscular fiber becomes paralyzed from over-distension, the bowels losing their wonted energy and contractile power, are incapable of expelling or diffusing it through the tube; hence the pain in flatulent colic. In this case an aromatic stimulant imparts tone and increased energy to the stomach and bowels, which enables them to contract upon it, and expel it through the cardia or pylorus, if in the stomach; if in the bowels, it causes a diffusion or an expulsion downward.

CONDITIONS CONTRA-INDICATING THEIR USE.

Stimulants are contraïndicated in cases of gastro-intestinal irritation or inflammation. In such cases their administration is attended with increased phlogosis.

In febrile and inflammatory affections, excitants are improper during the early stages, and it is only in the advanced stages of these diseases, after the arterial excitement has been moderated, and rapid prostration is manifestly unavoidable, that they are proper. Even in these cases, if there is pain in the epigastric region, if it is tender to pressure, if the distress is increased by the use of warm drinks, and the edges and apex of the tongue are red and dry, stimulants are highly improper.

In hypertrophy of the heart, in palpitation of the heart, if it depends upon an organic disease of that organ, stimulants are inadmissible.

They are also contraïndicated in phrenitis, apoplexy and congestion of the brain. Under circumstances of this character, their employment would be highly prejudicial to the patient.

In neuralgia, chorea, tetanus, epilepsy, etc., excitants are occasionally used with profit; but as a general rule they are unimportant, and in many cases very prejudicial. In these cases tonics are more permanent in their influence upon the system, and take the precedence over stimulants, especially if coupled with antispasmodics.

CLASS VIII.

ANÆSTHETICS.

By the term anæsthetic we understand an agent capable of occasioning a suspension of general sensation. In other words, this class of remedial agents are resorted to, to induce a state of temporary insensibility. Their use may be carried to the extent of causing but partial anæsthesia, but they are chiefly exhibited, however, until a state of entire insensibility is attained. This class of agents may be divided into two kinds; the first, acting upon the entire system, producing a like insensibility of all parts, may be termed *general* anæsthetics; while the second affecting but the parts to which it is applied may be called *local* anæsthetics.

To induce a state of insensibility in cases of excessive pain, especially in painful surgical operations, has been an important desideratum with the profession, eagerly desired for centuries past, and various means have been adopted, at different periods, to secure the desired object.

It is asserted that the Chinese were not unacquainted with anæsthetic agents as early as the third century. A Chinese book, in the National Library of Paris, states that when about to perform painful operations, a Chinese physician, by the name of Ho-à-tho, gave his patients a preparation of hemp, which soon rendered them insensible to the operation, however painful. The Greeks and Romans are said to have used anæsthetic agents. M. Velpeau states, that "The so-called Memphis-stone, dissolved in vinegar, after having been reduced to powder, was used as an anæsthetic agent among the Greeks and Romans; and mandragora was extensively known as possessing anæsthetic properties." Again the same author states that Hugh of Lucca, an eminent physician of the thirteenth century, employed anæsthetics. "A sponge dipped in the juice of nightshade, hyoscyamus, cicuta, lactuca, mandragora or opium, was put under the nose of patients, and made them sleep during operations." The Turks, it is said, have for a long time induced anæsthesia on subjects who were going to submit to circumcision. Sir Humphrey Davy used the nitrous oxyde gas to relieve tooth ache, and suggested its use in surgical operations. Mr Wells, of Hartford, employed this gas in 1842, for extracting teeth without pain; and others employed this, or some other agent, some 30 years ago, to relieve pain.

From the foregoing remarks it seems various agents have, at different periods of time, for many centuries past, been exhibited with a view to the induction of anæsthesia in painful operations and pain dependent upon other causes. Notwithstanding the use of these agents at different periods by certain physicians, they did not meet with general favor by the profession, for the reason, perhaps, that they were not regarded as reliable, or their use was not unattended with danger. The advantages and comparative safety of the agents now in use as anæsthetics, have but recently been discovered and fully tested. Those formerly used seem not to have been generally known—at least but few used them—and no agents of a reliable character in all respects have been known to the profession generally until within quite a recent period.

The meed of praise for the discovery and introduction into general use of an agent that would render painful operations painless, was reserved for our countryman, Dr. Morton, of Boston, who made known the results of his experiments with sulphuric ether as an anæsthetic, in 1846. Through the influence of Dr. Morton, and after repeated cautious experiments, Dr. J. C. Warren was induced to employ it in an operation performed at the Massachusetts General Hospital on the 15th of Oct., 1846. Anæsthesia was but partial in this case. On the succeeding day, Professor Hayward operated, having first induced a state of complete insensibility of the subject upon whom the operation was to be performed. From this beginning the anæsthetic power of ether, in the form of inhalations, spread with great rapidity throughout the civilized world, and is now regarded as one of the most important discoveries of the present century.

About one year after the anæsthetic powers of ether had been established, Professor Simpson, of Edinburgh, after repeated experiments, announced that *chloroform* was a still more effective remedy for producing anæsthesia. This new agent soon acquired a reputation equal and even surpassing ether. Its advantages were its more rapid and intense action, its smaller dose, and its more agreeable taste and smell. In addition to sulphuric ether and chloroform, other general anæsthetic agents have been discovered and experimented with; yet none have been found to possess their advantages. Among these we might name the *chloride of hydrocarbon*, *nitrate of ethyle*, *benzin or benzole*, *aldehyde*, *bisulphuret of carbon* and *amelyne*.

Importance of Anæsthetics.—As to the importance of anæsthetics as therapeutic agents, it appears to us no division of opinion can obtain. That the severity of the sufferings in many painful operations depresses the vital powers, exhausts the nervous energies, or communicates such a shock to the nervous system, and inflicts such an injury on many constitutions as to destroy life almost immediately, and in others to jeopardize the recovery of the patient, are truths which none are disposed to dispute. The induction of anæsthesia most effectually counteracts such results. Again, the powerful shock, the great depression, the exhausting and insupportable effects which the dread of pain, or the fear of an operation exerts upon the nervous and timid, serve, in many instances, to overwhelm the patient and sink his vital powers beyond the possibility of reaction; hence the prospects of a favorable termination are materially lessened, or, perhaps, entirely destroyed. Nothing more effectually destroys the recuperative powers, or the early reactive energies of the system, than fear; fear as to the final result, or dread of pain, overpowers or almost destroys life in many instances, even before the operation is commenced. Again, an operation is performed much more deliberately, and with much less perturbation by the surgeon, when the patient is not writhing in agony—when he is known to be enjoying entire immunity from pain, even though the operation be one of great severity. All the circumstances here alluded to, and many more, tend to increase the immediate danger, and lessen the prospects of a speedy convalescence—results which are counteracted by the induction of anæsthesia.

Does anæsthesia diminish the mortality following severe operations? This is a very important question, and if decided in the affirmative, adds much weight to the reasons already advanced in favor of its employment. That this is the case, we believe is not disputed at the present day. Mr. Curling says: "I have carefully watched the progress of cases, after operations of various kinds performed upon persons in a state of anæsthesia, and I can, with confidence declare that, so far as my present experience has reached, the constitutional symptoms have been milder, and the cases have proceeded more satisfactorily, than after operations in which no means had been taken to prevent pain. Several of my surgical friends can fully confirm this statement." Prof. Syme says: "As to the cases in which chloroform should be employed, it may be said that there are hardly any in which pain would otherwise be inflicted, where its use is not desirable for the patient, and incumbent upon the practitioner to propose. At an early period of our information on this subject, it was thought that in a state of collapse, or extreme depression from weakness, fatal sinking would be apt to result from the effect of chloroform. But so far from this being the case, it has been found that the most serious operations may be performed under the influence of this agent, in circumstances of the most extreme exhaustion, with results infinitely more successful than could have been anticipated otherwise." These authorities might be multiplied, but we wish next to see, from statistics, to what extent the mortality is diminished. The following table of the mortality of amputation of the thigh, with or without etherization, collected by Dr. Simpson, will illustrate this point:

Names of Reporters.	No. of Cases.	No. of Deaths.	Percentage of Deaths.
Parisian Hospitals—Malgaine, - -	201	126	62 in 100
Edinburgh Hospital—Peacock, - - -	48	21	49 in 100
General Collection—Phillips, - -	987	435	44 in 100
Glasgow Hospital—Laurie, - - -	127	46	86 in 100
British Hospitals—Simpson, - -	284	107	88 in 100
Upon patients in an etherized state, - -	145	87	25 in 100

"The preceding figures" says Dr. Simpson, "speak a language much more emphatic than any mere words that I could employ in favor of anæsthesia, not only as a means of preserving surgical patients from pain, but as a means also of preserving them from death. Between even the lowest mortality in the table without anæsthesia, 36 in 100, and the rate of mortality with it, 25 in 100, there is the difference of eleven per cent. That is to say, according to this standard, out of every 100 patients submitted to amputation of the thigh without anæsthesia, eleven more would die from the operation than if the same 100 patients were submitted to the same operation in a state of anæsthesia."

The same arguments may be adduced in favor of anæsthesia in parturition. Although they check the pains for a short time, yet they promptly return and are often more efficient and the labor progresses with greater rapidity than when they are not employed. In painful and difficult labors, in cases of rigidity of the os uteri, or of the perineum, vaginal muscles, and surrounding soft parts, in cases of turning, use of forceps, and other operations, in spasms or convulsions, adherent or retained placenta, hour-glass contractions, etc., anæsthetics merit our special attention.

While in a state of anæsthesia the patient enjoys entire freedom from the sufferings which in many cases are extreme, and the shock that would otherwise be inflicted upon the nervous system. Not only so, but the freedom from pain, and loss of consciousness renders the patient passive, when otherwise her restlessness might prove injurious, rigidity of the soft parts is removed, the vaginal secretion increased, and yet the contractions of the uterus are said to retain all their expulsive force. It must be evident that the dread of pain or fear of suffering, must cause a voluntary if not involuntary resistance on the part of the patient to the progress of labor, and to the operations incidental to obstetrical practice. Is it not then apparent that when the system is in a perfectly passive state, when entire relaxation exists, all resistance of a voluntary character being withdrawn, and all spasm or rigidity of the muscular fiber calculated to retard the advancement of labor being overcome, while the uterine contractions remain in full force, labor must be greatly expedited, and that at far less expense to the physical and nervous energies of the system. The facts in the case bear out the arguments adduced above in favor of the use of anæsthesia, if the statistics of European hospitals as well as private practice are reliable data upon which to base a conclusion. Labors have been more rapid, the system less exhausted recoveries more speedy, while the occurrence of rigors, ephemeral fevers, abdominal pains, convulsions, puerperal inflammation and fever, and many other serious diseases incidental to the puerperal state, is greatly reduced by the employment of anæsthesia.

Anæsthetics have been employed with unequivocal advantage in *puerperal convulsions*. The violence of the spasm yields promptly to their influence, and is often immediately arrested. If other measures fail, their importance in these cases should never be overlooked.

They have been used in both *idiopathic and traumatic tetanus*, more especially in the former variety, with much success. Their influence should be maintained for a considerable length of time, in order to secure the advantages to be derived from their exhibition. They have also afforded temporary relief in cases of *hydrophobia*, although not a prolongation of life.

Spasmodic asthma is another affection in which entire and immediate relief of the paroxysm has followed their exhibition. The relief they afford in these cases, is but temporary, it is true, nevertheless it is a respite devoutly desired by the patient.

In *delirium tremens* their effects are said to be very satisfactory. The induction of anæsthesia is often somewhat difficult to be attained in this affection—more especially if ether be the anæsthetic used; but so soon as quietude ensues an artificial sleep follows, which is soon succeeded by a natural sleep, more or less protracted. When the patient awakes to a state of consciousness, he is calm and perfectly composed If the patient is weak, and the system already exhausted by continued debauchery, the induction of anæsthesia should be gradual.

Anæsthetics have been used with great success in cases of *neuralgia*. Their exhibition in this disease is seldom unattended with temporary relief of pain; and should the pain return, a repetition of the anæsthetic again removes it, and by two or three repetitions it has, in many instances, been entirely subdued.

In other painful affections, as toothache, rheumatism, sciatica, colic, spasm of the stomach or bowels, etc., their use is salutary and desirable; even in the more painful and spasmodic forms of *Asiatic cholera,* we have no doubt but partial anæsthesia would afford much relief; but it should not be allowed to interfere with other medication for the radical cure of the disease. If used at all in this case, it should be only with a view to the relief of the extreme sufferings of the patient.

Action of Anæsthetics.—General anæsthetics no doubt act directly upon the cerebro-spinal centers. The inhaled vapors are first absorbed into the blood, as is proved by the detection of them in different parts of the body,—even in amputated limbs,—and in their exhalation by the breath for a considerable length of time after the cessation of the inhalation. Their first effects are loss of mind and volition, then follow loss of sensation and motion, and lastly the power of respiration.

Anæsthetics first cause excitement, attended with ringing in the ears, restlessness, confusion of intellect, and partial insensibility. In some cases, great excitement, accompanied with screaming and violent efforts are among the first manifestations of its action on the system. Very soon a sleep, more or less profound, follows, consciousness is lost, the muscles are rigid, and the sensibility blunted. Soon, however, a state of general relaxation follows, with a profound sleep, and an entire loss of sensibility; respiration in this stage becomes stertorous, though regular; the pulse is also regular. Finally, the respiration becomes irregular, or interrupted, and the pulse weak and fluttering, and if permitted to continue in this state for but a few seconds, respiration would cease and death ensue. The order here stated is not always observed, for the effects are irregular in many cases. In some instances no period of excitement is observable, the patient at once sinking into a state of profound narcotism. In others, the sensibility is lost, while consciousness remains unimpaired.

Although this is denied, yet cases of parturition, as well as painful operations are reported, in which consciousness remained unimpaired, perception clear, yet sensibility was greatly diminished, or entirely destroyed. In other cases, sensibility remains, as is evinced by the screams and evident suffering—the patient, however, being unconscious, and having no recollection either of suffering, or of any thing that occurred during the operation.

Dr. Snow divides the action of anæsthetics into five stages, or degrees; and though it will be almost a repetition of what we have already stated, yet as our object is to present the subject in the plainest form, we will quote his remarks.

"In the *first* there exists a kind of inebriation, which is usually agreeable when induced for curiosity, but is often otherwise, when the patient is to undergo an operation. Consciousness to surrounding objects remains unimpaired, though the power of vision seems slightly affected, and sensation is so much blunted that the pain of disease, which is generally due to a morbid increase of the common sensibility, is in many cases removed or relieved, according to its intensity.

"In the *second* degree, the mental functions are impaired, but not entirely suspended; consciousness, however, no longer continues correct, and a sort of dreamy state supervenes. This degree may be considered analogous to delirium, and to certain states of the patient in hysteria and concussion of the brain; and it corresponds with that condition of an inebriated person, who is *not dead drunk*, but in that state described by the law as *drunk and incapable.* It is very transitory, and if the inhalation be suspended, the patient in a very few minutes recovers the perfect possession of the mind. A considerable degree of anæsthesia is induced, even in this stage; and sometimes a high amount of mental excitement, that renders the patient difficult to manage, shows itself.

"In the *third* degree, all voluntary motion is paralyzed; and often a rigid, spasmodic contraction of the muscles of the extremities occurs. The mental faculties are completely in abeyance, the eyes are most frequently drawn forcibly upward, and the vessels of the conjunctiva sometimes become injected with red blood. It does not follow, however, that an operation may always be commenced immediately the narcotism reaches this degree, for anæsthesia is not a necessary part of it.

"The *fourth* degree brings with it relaxation of the voluntary muscles, together with complete insensibility to external impressions, so that no pain is felt even on the infliction of severe personal injuries. Yet, although reflex movements can not be excited by touching even the most sensitive parts of the frame, still some functions of the spinal cord remain, as the sphincters continue contracted, and according to most of its advocates, the action of the uterus in labor is not materially interfered with. The breathing is not unfrequently attended with some degree of stertor.

"The *fifth* degree of narcotism, is *the commencement of dying*. The breathing first becomes irregular, slow, and difficult; then soon ceases altogether—while the heart continues to beat for a short time, even after the last breath is drawn."

Mode of Administration.—General anæsthetics are all of them administered in the form of vapor. All the anæsthetic agents yet discovered are very volatile, the vapor being inhaled and absorbed into the blood, through the capillaries of the lungs, is conveyed by it to all parts of the system, specially affecting the brain and spinal cord. Many forms of apparatus have been invented for exhibiting these agents, but like many other things in medicine and surgery, the simplest means has proved the best. The mode in which ether and chloroform are now principally administered in this country, is to take a handkerchief or napkin, folding it three or four double, and pouring on the center of it about a drachm of the anæsthetic. This is applied to the nose, yet not so close as to prevent the inhalation of a sufficient quantity of air with the vapor: it is brought gradually closer to the face, as the patient comes under the influence of the agent. M. Chassaignac recommends a sponge, about as large as a man's fist, wetted with the anæsthetic, and tied up in the corner of a napkin. "The napkin, which contains the sponge in its knotted corner, covers up the patient's eyes, so as to hasten and facilitate the anæsthetic stupor. It prevents also too large a proportion of air mingling with the vapor of chloroform." He also recommends that the patient be always placed in a recumbent position. This though the best position, is not indispensable, for we have seen many cases in which it was administered in a sitting posture, with perfect safety.

The question now arises, *To what degree should anæsthesia be carried in order to obtain its beneficial effects, and yet incur the least danger of a fatal result?* In reference to this question there has been much difference of opinion, some maintaining that the second and third degrees are sufficient, illustrating their views by keeping their patients in a half-sleeping, half-waking state, requiring the almost continued administration of small portions of the anæsthetic; while others contend that the *fourth* degree, or *stage of toleration*, should be secured in all cases before commencing an operation.

M. Chassaignac thus describes the symptoms to be noticed, and the stage of tolerance in the exhibition of chloroform, which he believes is the proper degree of anæsthesia to be obtained. After describing the first few inhalations, he says: "I then concentrate my whole attention on the symptoms which reveal the degree of anæsthetic action; the following are the sources of information to which I apply:

"*a.* The state of the pulse.

"*b.* The state of the respiration, appreciated by inspecting the epigastric region, which expresses in a far more significant manner the state of that function than the costal walls of the thorax.

"*c.* The patient's face, which, by its sinister expression, often indicates the approach of danger, long before the respiration and pulse have caused any serious apprehension.

"*d.* I attend with particular care to the last manifestations of the period of agitation, and the first appearance of the stage of collapse. At this moment I immediately remove the sponge, and wait for the stage of 'tolerance.' Lastly, when this stage is fully established, on the slightest manifestation of returning sensibility, I give the patient small quantities of chloroform by means of the above-mentioned apparatus.

"This, then, is the manner in which I proceed, and these are the means by which I seek to obtain, before operating, what I call 'anæsthetic tolerance.' The inhalation is commenced with all due caution, and when the period of agitation arises, I allow it to pass off without suspending the inhalation, until the patient arrives at the state of collapse. As soon as this is manifested, I suspend completely the inhalation. I wait until the respiration and pulse become regular, and until the patient is plunged into that peaceable sleep which in many persons succeeds to the first stages of anæsthesia. This sleep—with perfect regularity of the great functions, with decrease in the number of pulsations, with complete equilibrium of the respiration, which is deep and calm—constitutes for me the state of anæsthetic tolerance.

"I can affirm, from having experimented a great number of times, that when the patient has arrived at this state he is subject to no kind of danger, whatever may be the time during which it is prolonged. It is to be remarked, that in this state the general insensibility and muscular resolution are present almost in the same degree as in the period of collapse. But when the 'tolerance' exists, sensibility will revive, if we do not take, in this respect, particular precautions. And it has been observed that, in patients arrived at this state of almost saturation, very small quantities of chloroform, in doses incapable of bringing on any accident, suffice to sustain the anæsthesia, without disturbing in any way the state of 'tolerance' in which the economy is plunged. We have, then, every kind of security that we can wish for; first, against pain, complete insensibility; secondly, against dangerous functional disturbance, perfect regularity of the functions. And besides, the surgeon, exempt from all anxiety on the score of the anæsthesia, can give himself up entirely to the operative department.

"This state of 'anæsthetic tolerance,' unfortunately, is not always as easy to obtain as one might believe; there are subjects whose constitution is, in some manner, opposed to it. It would seem that we can only obtain from them excitement or collapse, and that the medium state, which constitutes essentially 'tolerance,' can not be produced. They commence, as do nearly all subjects, by excitement, and arrive at collapse; but as soon as this is about to finish, it gives place to new excitement. It is only in children, in certain women, or in adults very debilitated, that we pass from the period of excitement to that of 'tolerance,' without observing the state of collapse."

It has already been stated that the fourth degree of anæsthesia, according to Dr. Snow, is the stage termed by M. Chassaignac that of "toleration"; but this is not exactly the case, it being a medium between that and the third degree. Thus, when we exhibit chloroform, we find that when we reach the fourth stage,—*relaxation of all the voluntary muscles, and complete insensibility*, or as it is termed by M. Chassaignac, "*the stage of collapse*,"—there is more or less irregularity of the respiration and circulation. As soon as this subsides, we have the state of "tolerance" described.

Contra-Indications.—Some states of the system are less favorable to the use of these agents and the induction of anæsthesia than others. Organic diseases of the heart and large vessels, as hypertrophy of the heart, ossification of its valves or of the large arteries, aneurisms, etc., contraïndicate their use, or at least lessen the probability of a successful termination. These conditions do not, however, absolutely forbid their use; but in such cases they should not be employed without they are imperatively demanded, and should then be used with the greatest care and caution. In cases of great plethora, anæsthesia is effected with greater difficulty, and with less regularity. To obviate this, a hydragogue cathartic should be prescribed, and abstinence enjoined previous to the use of the anæsthetic, unless the delay will augment the danger.

In order to insure success, quietude or a state of perfect tranquillity should be enjoined and obtained, if possible; not that it is impossible that a state of anæsthesia may be secured without the observance of these rules. Talking to the patient, or loud talking in the room, should always be prohibited, as it always increases the difficulty of bringing the patient under the influence of the anæsthetic.

Food should not be taken a short time previous to the exhibition of the anæsthetic; in other words, the last meal should have time to digest before its administration. The reason for this is, that otherwise the anæsthetic would be very apt to produce vomiting as its effects were passing off, or even during an operation, providing the agent happened to be suspended, and the patient commenced to recover from its effects.

A free supply of atmospheric air is absolutely required in conjunction with the anæsthetic at all times; for without it life is endangered. The failure to observe this precaution has undoubtedly given rise to most of the fatal results arising from the use of chloroform.

It is an imperative rule that the one who administers the anæsthetic should watch the pulse, the respiration, and the general state of the patient, closely, from the first inspiration until sensibility and consciousness are completely restored. "Not one beat (says a writer) should the heart give that the finger does not take note of." We think, however, that the signs furnished by the respiration are of more importance. As soon as the pulse begins to sink or flutter, the anæsthetic should be removed, and fresh air admitted. If the respiration becomes stertorous, the inhalation should be discontinued; and should it be irregular and interrupted, the danger is great, and active measures to restore the patient should be adopted. Among these we might mention blowing in the face, dashing cold water in the face, the application of strong nasal stimulants, as the ammonia, etc. The importance of this last is so great, that surgeons who make much use of these agents invariably have the ammonia in the room. Should these measures fail, *artificial respiration*, or the *ready method* of Marshall Hall, is not to be neglected; it is, indeed, the sheet-anchor of our hopes, or, as a certain writer remarks, the alpha and omega in this emergency; and if long withheld death must be inevitable.

Local Anæsthetics.—On this division of anæsthetic remedies we will not have much to say, for as yet they have proved only partially successful. While general anæsthetics act upon the nervous centers, in great part stopping innervation, and producing complete insensibility of all parts of the body, these act directly upon the nerves of the part, so changing their condition that they no longer transmit impressions.

If perfect local anæsthesia could be attained, there is no doubt but what it would prove preferable in many cases to its general induction, as it must be admitted that there is more or less danger in the administration of the latter class of agents. Still, we as yet see no prospect of a much greater success than has already been obtained.

The first mode of producing local anæsthesia, that is well authenticated, was proposed by Dr. Moore, in 1784. It consisted in compressing, by torniquets and pads, the nervous trunks going to the limb to be operated upon. It was tried with partial success by John Hunter, in a case of amputation of the leg. It is stated that in this case, "at the circular incision through the skin, the patient did not cry out, change a muscle of his face, or show any symptoms of pain. At the subsequent parts of the operation, particularly during the sawing of the bones, he showed marks of uneasiness in his countenance, but did not cry out." Dr. James Arnott proposed to employ a freezing mixture, to induce local anæsthesia. His mode of applying it consisted in filling a bladder partly full of tepid water, placing it upon the part so as to cover the portion of skin to be rendered insensible; then gradually dropping in ice, and lastly salt, so as to bring the temperature gradually below the freezing point. This method has proven successful in operations upon the skin and superficial parts, but can never be employed as a substitute for general anæsthetics in the major operations. We have employed it with success in removing a small subcutaneous tumor, in removing inverted toe-nail, and to remove the sensibility when lancing felons, abscesses, etc.

Experiments have been made with the vapor of chloroform and other agents, applied locally; but they have not proved successful. It has been proved, however, that they are capable of relieving the pain attendant upon many morbid states, both of the skin and mucous membrane. Thus the vapor of chloroform, directed upon the part in a jet, will remove the pain of irritable ulcers, and when injected into the vagina, will remove many painful and neuralgic conditions of the uterine and adjacent organs. For this latter purpose, however, it is not equal to carbonic acid gas, which we have found eminently useful in relieving dysmenorrhea, irritation of the uterus, bladder, urethra, rectum, etc., and to relieve the pain in malignant disease of these parts.

DIVISION III.

CLASS IX.

TONICS.

TONICS are medicines which produce a permanent exaltation of the energies of the general system, without materially increasing the vital manifestations in any particular organ. They give tone to the muscular system without increasing the temperature of the body or rapidity of the circulation, producing no immediate and marked excitement like stimulants. Their influence is manifested by a very slow and permanent exaltation of organic action, evinced by an increased force of the circulation, and increased muscular power. The heart contracts with more force, but its contractions are not increased in frequency; the pulse acquires fullness and firmness, and loses that soft, flaccid and atonic character which is a manifestation of debility. The protracted use of tonics may produce an increased temperature of the body and an acceleration of the pulse; but these are but secondary effects arising from increased nutrition.

From what has been said of the influence which they exert, it will readily be seen that they are particularly adapted to atonic states of the system. Their primary sanative impressions are doubtless made upon the nervous system, while the manifestation of these impressions is seen in the increased tone of the muscular system, in the improved state of the secretions, in the augmented force and fullness of the pulse, and in the increased rapidity and perfection of digestion. The increased energy which they impart to the nervous system, the impetus which they give to the circulation and the improvement in the digestive functions, together with the increased secretion and absorption which they effect, are among the many evidences of their sanative powers.

Very peculiar, and apparently very dissimilar effects upon the secretory organs and tissues follow from the use of tonics, under different pathological conditions of these organs and tissues. When the secretions become abnormal and superabundant, from an atonic state of the secretory organs, this class of agents have the power to restrain and control them. Thus, if the cutaneous exhalation becomes superabundant from debility, as is the case in the advanced stages of phthisis, typhus and typhoid fever, etc., tonics often promptly restore the tone of the system and arrest it. Also, in phthisis and other diseases of the respiratory apparatus, when the secretion from the lungs becomes excessive from debility; and when this discharge would tend to increase that debility, tonics, combined with astringents, are of much value in arresting the secretion. The same remarks apply to diabetes, chronic diarrhea, leucorrhea, menorrhagia, passive hemorrhages and passive dropsies; in all of which cases, tonics will be found important auxiliary agents in restraining the morbid discharges. When, on the contrary, the secretions are lessened or arrested from torpor or atony of the organs, or from a languid or enfeebled state of the circulation, or of the general system, tonics are by no means an unimportant class of agents in aiding in the reëstablishment of them. If the kidneys, skin, uterus or lungs, fail to furnish their due secretion, from a torpid state of the organ, or from an enfeebled state of the general system, tonics are of much importance in restoring them; in such cases they exert a diuretic, diaphoretic, emmenagogue and expectorant influence.

Tonics are mostly derived from the vegetable kingdom, and are remarkable for their bitterness; though from the similarity of their action, we include in this class the mineral acids and the chalybeate preparations.

The chalybeates do not, like the bitter tonics, act topically upon the stomach and alimentary canal, imparting new vigor to the parts with which they come in contact. They act on the restorative principle entirely; being absorbed, they supply a material to the blood, improving its quality, and in this way exert a tonic influence upon the entire system. Iron is found to be an important ingredient in the red globules of the blood; and when these globules are deficient, as they are in anemia, the administration of iron will cause a regeneration of these, and a restoration of the system to health.

Action of Tonics.—Tonics act in two ways upon the system, producing their restorative effects.

1st. By their topical influence they give increased nervous and muscular energy to the stomach and bowels, and stimulate the mucous membrane to normal action; they thus improve digestion, increasing the appetite, and improving the quantity and quality of the chyle. If digestion is imperfect, the chyle must be unhealthy and scanty, and as the chyle supplies the material for the formation of the blood, which in turn supplies the system with the material to replenish the waste of tissue, and for the growth of the body, it is evident that normal digestion must be carried on, if the system maintains its healthy functions. Tonics, then, by their influence over the alimentary canal, prove indirectly restorative, by increasing the appetite, increasing digestion, chymification and chylification, and furnishing a healthy pabulum, both in quantity and quality, for the formation of the blood.

2d. All of this class of agents are readily soluble in the fluids of the body, and hence are absorbed into the circulation, and act from it upon every part of the system. We have already seen that they exert a tonic and strengthening influence when topically applied to the stomach; and we may notice a similar influence, from their application to indolent ulcers, wounds, etc., when applied so that we can notice their effects. If this is the case then, that they impart strength and tone when brought into contact with the tissues, as it undoubtedly is, we have a solution of their effects after absorption. The circulation conveys them to every part of the system, they are brought in contact with every fiber and every cell; and if they act in the circulation as they do when topically applied, they give new energy and tone to every part.

They likewise act as restoratives in many cases, adding to the blood some material that was deficient in it. In this way both the vegetable bitters, iron, acids, and alkalies act as tonics. For a further description of the action of these remedies see general therapeutics.

Tonics not only produce their specific impressions when taken internally, but also when applied to the surface of the body, from which they may be absorbed. Their external application is of much importance in all cases where there is extreme debility, and when the stomach is weak and irritable, and will not tolerate the use of medicine. In all cases of extreme debility, they may be used as a bath, or by enema, when they will exert their ordinary invigorating influence upon the system. In the "night-sweats" of debilitating diseases, they are often of much advantage, strengthening the skin and checking the morbid secretion.

Their topical application deserves a passing notice. They are frequently applied to old atonic and indolent ulcers, and also to gangrenous parts, as topical tonics, with much advantage. We thus cleanse the gangrenous or ulcerated parts thoroughly and frequently with a strong decoction of the tonic, and also apply it in the form of a poultice mixed with slippery-elm.

Therapeutic Indications.

Tonics are administered with much advantage in *dyspepsia*. When the stomach is debilitated, its coats do not act with the necessary energy upon the alimentary mass, and the gastric secretions are either scanty, or do not possess their proper solvent powers, and chymification will therefore be imperfect, and the train of dyspeptic symptoms follow. These results are counteracted by the use of tonics, in the manner already referred to.

In all cases of asthenia they are indicated, unless it be connected with some local inflammatory affection that would be aggravated by their use. They become important agents in the advanced stages of most of the acute diseases, after fever has subsided, and when high inflammatory action no longer exists; in such cases they enable the system to throw off the disease, and render convalescence much shorter. In adynamic fevers, as typhus gravior, typhoid, scarlatina maligna, gangrenous erysipelas, or in any case where there is a tendency to gangrene or putrescency, they are agents of the first importance. In smallpox, where the vital powers are much prostrated, in carbuncle, scorbutis, scrofula, and other similar affections, their employment constitutes an important part of the treatment. They are also indicated in passive dropsies and hemorrhages.

Debility of a single organ or of the entire system, predisposes to the morbid influences of surrounding causes of disease, as the infection of certain contagious diseases, changes of temperature causing the retention of a customary secretion, the morbid effects of miasmata, etc. Tonics aid the enfeebled energies of the system in warding off these extraneous causes of disease. Malarious influences occasionally produce almost every variety and type of fever, particularly the intermittent, beside many anomalous diseases which have a more or less periodic character. Hence we have headache,—especially hemicrania,—neuralgia, toothache, rheumatism, deafness, dyspnea, convulsions, etc., assuming a periodic form. It has been proved beyond cavil, by medical reports from the malarious coast of Africa, that tonics administered as prophylactics, are a certain preventative against this influence.

In diseases marked by a periodic character the most powerful tonics are administered. Some of them are supposed to possess *antiperiodic* in addition to their tonic properties, and are therefore called *antiperiodics*. The cinchona and its alkaloid principles are examples of this kind. The question then arises, do tonics arrest these periodical diseases by virtue of their tonic properties alone, or are they possessed of *febrifuge* or *antiperiodic* powers in addition to these. The latter view appears the most probable, for we find that those agents which act as antiperiodics possess but feeble tonic properties, in diseases in which this periodic element is lacking; that is, they do not increase the appetite, improve digestion, etc., in cases of common debility. These agents may likewise be administered in any stage of the fever, and if the stomach is not in an irritable condition, they will lessen instead of increasing the pyrexia. Why certain agents of this class exert this peculiar antiperiodic property we are unable to explain, any more than we are why some causes produce periodic fever; the fact, however, is evident that some of them possess a power over this form of disease that is not possessed by others of the class.

As probably the best explanation of the action of the antiperiodic tonics we will introduce two quotations. Liebig in considering this subject, says:—"This action is commonly said to be dynamic—that is, it accelerates, or retards, or alters in some way the phenomena of motion in animal life. If we reflect that this action is exerted by substances which are material, tangible and ponderable; that they disappear in the organism; that a double dose acts more powerfully than a single one; that, after a time, a fresh dose must be given if we wish to produce the action a second time; all these considerations viewed chemically, permit only one form of explanation; the supposition, namely, that these compounds, by means of their elements, take a share in the formation of new, or the transformation of existing brain and nervous matter." Dr. Wood says in relation to this subject: "I know of no better explanation of the antiperiodic property, than that which supposes it to depend upon the powerful influence exercised by the remedy upon the nervous centers, through which probably the paroxysms are produced. Every consideration in connection with the peculiarities of regular intermittent diseases, leads to the conclusion, that the paroxysms are produced by an influence acting through the cerebral centers, without which the result would not take place. Now, if these cerebral centers can be preöccupied by a strong impression from some other source, they may be rendered insensible to the morbid influence, and the paroxysm, therefore, is set aside."

In addition to this influence upon the nervous system, antiperiodics undoubtedly exert a specific and decided influence upon the blood. This they may do in two ways:—First, by counteracting the chemical changes going on in that fluid,—preventing the septic action of the morbid material (which we suppose to be the cause of the fever) upon the blood. They also give increased vitality to the circulating fluids, (see *antiseptics*). Second, by causing an increased elimination, they remove the cause of the disease. We have long since arrived at the conclusion, that *quinia*, which may be taken as the type of the antiperiodic agents, owes its virtues in part, in periodic diseases, to its action on the excretory organs. When successfully administered it invariably causes relaxation and increased secretion from the skin, and this secretion gives evidence by its sensible qualities of an increased elimination of solids. It likewise increases the action of the kidneys, and consequently elimination by this channel. To sum up then, we may say, that antiperiodics act upon the nervous centers, increasing innervation, and changing the character of nervous action; that they act as *tonics*, increasing the vital force of the system; that they act as *antiseptics*, counteracting the septic tendency in the blood; and that finally they act as *eliminatives*, removing morbid material from the system.

In conclusion we may say in reference to this class of agents, that their use is indicated whenever the system is depressed below its normal level. They act directly in support of the vital force, and not as is the case with stimulants to produce merely nervous excitation; they therefore assist nature in the removal of disease. "Tonics," says Headland, "are among the most useful of all medicines. And it is certainly not the least of their recommendations, that we can seldom or never do harm by their use. They are remedies, but not poisons. Many a man has been killed by opium, many a constitution ruined by mercury, but it has never been known that quinine has done the one or the other."

CLASS X.

ALTERATIVES.

ALTERATIVES are defined to be agents which change, in some *insensible* and *inexplicable* way, certain morbid actions and conditions of particular organs, or of the general system. They produce no sensible evacuation, or modification of function, by which we can in any way judge of their mode of operation. They are administered to counteract certain morbid habits of the body, or cachectic states of the constitution, and to reëstablish the healthy functions of deranged organs.

Their precise *modus operandi* is involved in much obscurity. Doubtless much efficacy is occasionally attached to certain articles commonly regarded as alteratives, when their supposed salutary influence is wholly the result of the recuperative powers of the system. Nevertheless, an inquiry into the action of this class of agents, though it may be somewhat speculative, will not, it is believed, be wholly uninteresting to the therapeutist.

The term alterative is extremely indefinite, since nearly every article in the materia medica may alter, modify or change the action of certain organs or parts, promote diminished or suppressed secretions, restrain them if too profuse, change them if abnormal or vitiated, and thus exert either a direct or indirect alterative influence upon the system. Yet these agents produce some sensible impression, some perceptible influence upon certain organs or secretions, or upon the general system, which will characterize their action, and impress the mind with the difference between them and agents of this class which act in the manner defined above.

It can not be disputed that many of the articles which we call alteratives do act in sensible ways upon the system, as well as in the *insensible* manner referred to. Some of them act as general or special excitants upon certain organs or tissues, or as corroborants; but these influences do not seem to be sufficient to explain their curative action in those affections in which they are administered. There are other articles which possess very similar properties, and exert the same or similar sensible influences upon the system without producing that important alterative influence so desirable in certain chronic diseases. That the value of these agents as alteratives is dependent in part upon their sensible influence upon the system, we think can not be doubted; but their special influence in certain forms of disease must be dependent upon some action not yet determined. We may speculate on this peculiar action, but, although our reasoning may be correct, in the present state of our knowledge we can not demonstrate it to be so.

We suppose, from their known effects, that alteratives may act in the following way: 1. They may change the condition of the blood by a direct influence exerted upon it after the absorption of the remedy; and this change may be either *chemical* or *dynamical*. 2. They may in some manner effect the removal of the worn-out tissues, and favor the process of nutrition. 3. They may neutralize or change the character of decomposing or noxious agents that exist in the system as the result of some pathological process, or that have been introduced from without. 4. They undoubtedly favor elimination by stimulating the excretory organs to increased activity.

In order that alteratives should act in the ways mentioned above, it is necessary that they should be absorbed. We find that all agents of this class are soluble in the fluids of the body, and hence are necessarily absorbed; and as further proof of this, many of them may be detected in the secretions.

The alkaline alteratives, as well as the *halogenous* bodies, iodine, chlorine and bromine, doubtless exert their influence in all four of the ways mentioned. Thus, they change the condition of the blood by acting chemically upon it; they tend to break down the worn-out tissues of the body, and thus prepare the way for nutrition; they change the character of some of the products of decomposition, so as to permit of their excretion; and they act as direct eliminatives, stimulating one or more of the excretory organs to increased action.

The vegetable alteratives may act in a similar manner:

though as they are complex organic bodies, and subject to change when introduced into the system, we have no means of knowing either their chemical or dynamical influence upon the blood, or upon the tissues. That they may exert even a more powerful chemical influence than the agents first named, is not impossible. They may add something to the blood, or take something away from it; or by their mere presence they may give rise to a chemical action between the constituents of that fluid, in a manner similar to the action of emulsine, when added to the material of the bitter almond—by its presence giving rise to the formation of hydrocyanic acid.

All the agents of this class that have any well marked influence upon the system, prove directly eliminative; they either increase the secretion of the kidneys, skin or bowels, and the greater their power in this respect, the more efficient are they as alteratives. Thus the stillingia, when given in large doses, is cathartic and emetic; in small doses, it increases the secretion of the kidneys, bowels and skin. The compound sirup of stillingia produces a marked increase of all the secretions. Podophyllum, iris versicolor, juglans cinerea, alnus serrulata, chimaphila, etc., all act in a similar manner. We may say, then, that whatever action these agents have in the manner spoken of in the three first propositions, and they undoubtedly have some, they exert a beneficial influence by eliminating morbid material from the system. The reason why this action has not been fully recognized, is probably from the fact that this increase of the secretions is but gradual, and comparatively small to that produced by agents acting directly and quickly upon these organs.

In regard to the therapeutic application of this class of remedies, we will have to refer the reader to the description of the separate agents, as each of them exerts an influence peculiar to itself. As to their general application, they are employed in all chronic diseases in which there is a depraved or vitiated condition of either the solids or fluids. Thus, they are used in *scrofula, syphilis, scorbutis, tabes mesenterica, chronic hepatitis, dyspepsia, chlorosis, chronic rheumatism, chronic cutaneous diseases, etc.*

In many morbid conditions of the system, in which this class of agents are indicated, in addition to medicines, a change of air, diet, habits, scenery, employment, society, etc., will tend in a very marked manner to improve the mental and physical condition of the patient, and coöperate with the medicinal measures employed in restoring him to a state of health. The cold shower-bath, douche, alkaline or salt hand-bath, the medicated vapor-bath, etc., by keeping the skin in a healthy condition, and by their exciting effects upon the nervous system, also become valuable auxiliaries to the use of the remedies under consideration. In addition to these measures, especial attention should be paid to the regimen of the patient. A diet mild and unirritating in its qualities, easy of digestion, and nutritious, if taken in moderate quantities, will greatly contribute to the restoration of health; it furnishes the necessary quantity and quality of chyle for the formation of the blood, and thus acts as a healthy excitant to the vascular and nervous systems, furnishing healthy materials for the nutrition or renovation of impaired organs. In addition to the use of alteratives and a correct regimen, such agents will have to be employed from time to time as are demanded to fulfill special indications, as cathartics, emetics, diuretics, diaphoretics, sedatives, etc.

Thus it will be seen that a reliance on any one class of medicines, or on particular agents or remedial measures alone, in the treatment of these chronic diseases, would prove unsuccessful. It is by a combination of medicines, influences, and changes in the management of disease, that we accomplish cures. Repeated changes in the remedial, dietetic, physical, and mental influences, should be had recourse to in such cases. As one medicine or class of agents, one form of diet, or the physical and mental influences, lose their salutary effects upon the system, others should be substituted for them. In this way many cures may be effected that would resist a routine practice, and bid defiance to the most potent medicines. The superiority of one physician over another in many instances arises from the judicious selections and modifications which he makes in the various remedial measures employed, and in their adaptation to the various phases of the disease, and to the different states of the system.

DIVISION IV.

CLASS XI.

REVULSIVES.

Revulsives are a very important class of remedial agents, and are applicable in numerous diseases. Revulsion is undoubtedly a very important sanative influence of many internal remedies, as well as those which are applied to the surface with this object. As the term revulsive and its synonyms are ordinarily used with reference to local applications, we shall confine our remarks to their external employment in accordance with the general understanding of the term, and will only incidentally refer to the revellent influence of certain classes of internal agents, before closing this chapter.

Revulsives produce an exaltation of the vital manifestations of the parts to which they are applied. The principal object which the therapeutist has in view, when he applies this class of agents, is to produce a concentration of the vital energies upon external and less important parts, and thus relieve more important internal organs, that are in a state of congestion, irritation, or inflammation. They are derivatives or counter-irritants; they invite the vascular and nervous excitement to the surface, and thereby diminish the internal disease. It appears to be a law of the animal economy, that two points of irritation and fluxion can not exist at the same time; but that the stronger of the two should entirely relieve the weaker. We find that this is the case in the employment of these agents; if the irritation produced is greater than that at the seat of the disease, the brain will take cognizance of but the one point of irritation—and that is the one artificially produced; but if the artificial irritation is the weaker of the two, but little if any good results. This is undoubtedly the most important, but by no means the only influence exerted by this class of agents; as will be seen when we take up the different classes of revulsives.

In deep-seated diseases of important vital organs, we resort to these agents with a view of relieving the inflamed and engorged vessels by establishing a new point of irritation, stronger than the preëxisting one; the circulation is always determined to such a point as is expressed in the well-founded axiom, "*Ubi irritatio, ibi fluxus.*" This revulsive influence, or cutaneous excitation should be mild or severe, limited or extensive, according to the character of the disease which it is intended to relieve, and to the extent and importance of the part affected. Thus, disease of the lungs or liver would demand more vigorous counterïrritation than less important organs. When a surface as extensive as the pleura or peritoneum is involved in acute inflammation, feeble and limited applications would prove unavailing. Revulsion must be extensive and powerful, in proportion to the extent of surface inflamed, to the intensity of the diseased action, and to the importance of the organ or tissue involved. Speedy and intense counterïrritant agents, and slow and protracted means of the same character, are adapted to pathological states entirely dissimilar; the former to active and high grades of inflammatory excitement, the latter to the chronic phlegmasia.

It may be proper to say something respecting the relative importance of intermittent and continuous or permanent revulsion. Intermittent revulsion is more efficacious than continuous, the intensity of stimulation in the two cases being equal. The system does not become accustomed to intermittent counterïrritation; if the means are applied for a short time and removed, until its first influence is no longer experienced, and then reapplied, the same effects will follow its reapplication that it produced at first. Continuous revulsion may, however, exert a powerful influence by repeatedly removing the application and renewing it. Artificial irritation, when permanent, or long-continued, loses, to a great extent, its revulsive influence; it ceases to be an abnormal condition, and the point to which it is applied is no longer a center of fluxion; the derivative influence of the same agent exerts but a feeble influence after it has been long applied. This is especially the case with issues and setons. Though they may be kept open, and a discharge of matter be still maintained, yet they lose much of their revellent influence after they have been applied for a few weeks. The irritant, however, when constantly applied and frequently renewed, may keep up a constant influence, and the system will not become so accustomed to its action as to cause it to cease to be powerfully revulsive; thus, when the *irritating plaster* is applied, and not removed (excepting to renew it), for many weeks, or even months, it exerts a constant revellent influence, and does not lose its effects by long-continued application.

In all cases where we apply revulsives for the purpose of subverting inflammatory action, the object is to elevate the cutaneous organic action, or increase the vital manifestation in a contiguous part until it exceeds the internal morbid action. If the local stimulation, however, is excessive,—if super-excitation is established, instead of subverting the pre-existing morbid action, it may serve to increase it. It may do this by being situated in close proximity to the organ or part diseased, the excitation being transmitted by contiguity of tissue, or the super-excitation may injuriously affect the general system, cause excitement of the circulation, and thus increase the local disease.

Revulsives may with much propriety be divided into five classes. The names of these subdivisions imply the nature and extent of the revulsive influence upon the part to which they are applied. These classes are 1. *rubefacients;* 2. *epispastics* or *vesicants;* 3. *suppurants;* 4. *escharotics* or *potential cauterants;* and 5. *actual cauterants.*

I. *Rubefacients* are those revulsive applications which redden the surface by exciting an increased vascular and nervous influx to the point of artificial irritation; hence they may be termed *topical stimulants.* Experience has shown that when an internal organ is the seat of undue excitement, a similar excitement established in a contiguous part often relieves the pre-existing one. Rubefacients are any applications which redden the surface, as the mustard, capsicum, oil of turpentine, dilute aqua ammonia, liniments, essential oils, frictions, vapor of hot water or spirits, hot cloths, poultices, etc. The different agents of this class named, are adapted to different diseases; those that produce a speedy and powerful impression are adapted to acute cases; mustard, capsicum, hot applications, etc., are important in congestions and inflammations, while the milder agents are better suited to chronic affections.

These agents are employed as excitants in many cases of torpor of the system not connected with congestion or inflammation of internal parts. In coma they are exceedingly valuable as excitants, they often arouse the patient from that torpor and insensibility which is a very frequent concomitant of fever. In the advanced stages of fever, where the vital energies are rapidly sinking, or when a collapse has already occurred, rubefacients are sanative in the highest degree. Artificial and topical as well as internal and general stimulation is of unquestionable importance in sustaining the sinking powers of the system until reaction occurs and renders their further employment less important.

It is unnecessary to particularize, suffice it to say they are highly valuable in all forms of congestive or inflammatory fever, in adynamic fevers, and in the sinking stages of all forms and types; in the phlegmasia in general, they are indispensable therapeutic agents; in apoplexy they stand pre-eminent; in deep-seated neuralgia, in all congestions, inflammations or undue determinations to any organ or tissue of the body, if actively and efficiently used they supersede the use of the lancet, as well as other modes of counter-irritation, as blisters, etc., as well as the necessity of using so much medicine. They have also proved important in arresting hemorrhage; sinapisms applied to parts antagonistic to the one from which the bleeding occurs will often stop it entirely.

II. *Epispastics* or *vesicants* may cause redness, inflammation, vesication or blistering, suppuration, and in some cases sloughing, when applied to the surface of the body. Their effect on the skin is greater than rubefacients, as ordinarily applied; they cause an excitement of the capillary circulation, and an effusion of serum beneath the epidermis, or a blister. Vesicants exert their sanative powers mostly as revulsives, though they also act as *topical depletives*, and as stimulants. They produce a more lasting derivative influence than rubefacients, and in this respect are superior to them in many cases as revulsives. Generally, rubefacients are not properly applied, or their influence is not maintained for a sufficient length of time; being more painful than blisters, more speedy and transient in their effects, only a temporary and, in many cases of acute inflammation, limited advantage is gained by their employment, although they are capable of exerting even a much stronger revulsion than blisters. The advantage gained by a blister is not lost because the influence is continuous; when it is important to maintain permanent counter-irritation, and when the physician sees that a blister is applied, he feels that he has insured his object; whereas, if he depends upon the nurse to make the necessary revulsion, by the application of rubefacients, he has no assurance, if the case is important, that his measures will be properly and efficiently carried out. If the patient complains of pain, the nurse removes them; does not reapply them, or makes them too weak, or not large enough; keeps them on but a short time, or acquiesces, if the patient refuses to have them applied, though it may cost his life, and the reputation of his medical attendant.

Vesicants, however, should never be substituted for rubefacients when the latter agents will prove sufficient; for they are quite as efficient generally, if properly employed, and are less objectionable, blisters being much more apt to cause sloughing or gangrenous ulcers.

Epispastics are employed in the secondary stages of almost all inflammatory diseases. If applied during the high grade of excitement, or before proper antiphlogistics have been premised, they not unfrequently augment the inflammation. The same remarks apply to their employment in fever; if applied during the period of exacerbation, they increase the fever; if early resorted to as revulsives, they should be applied during the declining stage or period of remission. If, however, congestion or inflammation of some important organ exists that may endanger life, they may be employed early, without regard to the stage of excitement. Vesicants are adapted to protracted acute disease, and rubefacients to those that run their course more rapidly; both modes of revulsion may often be resorted to in the same case.

In erysipelas the advantages of vesicants are very conspicuous. They are supposed by some to act as excitants to the inflamed capillaries, thereby setting up a new action in them. By others they are supposed to act as *topical depletives;* they may exert a salutary influence in both ways, but the principal advantage is undoubtedly gained by relieving the engorged capillaries of their contents, thus giving them an opportunity to regain their normal condition.

Occasionally we meet with acute diseases, in which there is great prostration; but that prostration is more apparent than real. This is particularly the case in diseases of a nervous character. This apparent debility is often dependent upon congestion of some vital organ, by the application of a blister, or even a sinapism; we relieve the oppressed organ by freeing its engorged vessels, and the weakness is gone. Vesicants have occasionally proved of great advantage in protracted fevers, unattended by any local disease; no fixed point of irritation exists, yet the excitement is regular in its recurrence. In such cases a blister often speedily arrests the abnormal condition; it seems to give an increased impulse to the recuperative powers of the system, and it would also appear to act by localizing the excitement, thus breaking the chain of morbid associations and perverted sympathies. The blister is a new secreting surface, toward which the nervous and vascular afflux is directed, and the general excitement soon subsides.

In some cases an erysipelatous inflammation follows the application of a blister, which eventuates in gangrene, and in some cases produces a fatal result. In many of the eruptive diseases, and in adynamic diseases generally, blisters are very apt to cause gangrene and sloughing, owing to the want of vitality in the system to resist their action.

Epispastics should rarely, if ever be used in the diseases of children, especially when young; for at this age there is a peculiar susceptibility of the nervous system to all irritants; and they not unfrequently aggravate the general disease, and may even produce spasms and the death of the child.

III. *Suppurants* form the third subdivision of revulsives, and produce a still more intense degree of inflammation than epispastics. Their influence sometimes extends to the subcutaneous cellular tissue. They are much slower in producing their influence upon the parts to which they are applied than rubefacients or vesicants (if we except the issue), and are consequently adapted to chronic diseases. They are applied as permanent revulsives, as well as for the purpose of securing a copious discharge of matter. By establishing a constant drain, we insure a continuous determination of blood to the part to supply the demands of the new secreting surface. Among this class of agents may be named the *irritating plaster*, an exceedingly valuable application. Some use the tartrate of antimony, in the form of ointment or in solution, for the same purpose; but we object to its use for reasons which will hereafter be assigned. The seton is an example of the subdivision under consideration; as is also the issue, though it is usually commenced by the application of an escharotic. Irritating ointments, as the savin ointment, nitric or sulphuric acid ointment, etc., act in a similar manner. The system becomes habituated to the use of the *issue* and *seton*, and in consequence of their permanency they are found less efficient than intermittent revulsives, or even those kept constantly in contact with the part, as the irritating plaster.

Suppurants are resorted to mostly in the chronic phlegmasia. In many inveterate pulmonary affections, chronic hepatitis, nephritis, peritonitis, sciatica, lumbago, neuralgia, ophthalmia, articular inflammation, disease of the brain, etc. Their influence is most apparent when purulent matter is freely discharged.

IV. *Escharotics* or *potential cauterants* act chemically; they disorganize or destroy the vitality of the part to which they are applied. They are used to form eschars, issues, or artificial ulcers; in this way they act as suppuratives, and are employed in many chronic diseases as counter-irritants. They are mostly used, however, to destroy morbid growths, cancer, tumors, to remove the callous of fistulous pipes, etc.

V. The *actual cauterant* is any mode of applying heat enough to derange or disorganize a part. The incandescent iron, the moxa, heated vapor, hot water or other fluids, all act as actual cauterants. These agents act rapidly, and they are therefore resorted to when a very powerful and speedy impression is demanded. They are applied in cases of deep-seated pains that resist milder revellents; in neuralgia they are supposed to prove beneficial by suddenly abstracting the nervous energy from the nerve affected. They are also applied to bleeding vessels to arrest hemorrhages, to destroy morbid growths, etc.

DIVISION V.

CLASS XII.

ASTRINGENTS.

ASTRINGENTS are remedies which, when brought into contact with any portion of the body, cause a contraction or condensation of the tissues. They have been supposed by most writers to exert their influence exclusively upon muscular fiber; and hence, to account for their action in all cases, they have asserted that this tissue exists in parts in which anatomists have never been able to detect it. All living tissues have a certain degree of cohesion and condensation, by which they are enabled to perform their various functions in the body. The loss of this, in diseased states, unfits them for the proper performance of their functions. This cohesion is caused by the stimulus of the blood when in a normal condition, and the influence of the nervous system.

Action of Astringents.—Astringents have a double action on animal tissues; they have both a chemical and dynamical action. All the vegetable astringents have the chemical property of coagulating albumen, as also have the mineral agents. This action, however, will not explain their effect upon the living body, for they could not combine with it to any great extent, without causing an entire loss of vitality. As long as the vital force is in action, it opposes these chemical reactions, and when chemical laws gain the ascendency in a part, they destroy life in it. The dynamical action of those agents it is impossible to explain; we know that they will cause a condensation of any tissue with which they are brought in contact, and we have to be satisfied with a knowledge of the fact, and admit that the cause is beyond our reach:

Astringents are used both as topical and as internal remedies. Their topical effect we have already noticed—they cause constriction of any and all tissues with which they are placed in contact. The majority of these remedies are soluble in the fluids of the body, and when administered, are absorbed, and conveyed by the blood to the parts upon which they tend to act—their action in this case being similar to that produced when locally applied.

Therapeutic Application.—The therapeutic application of this class of agents is confined principally to excessive morbid discharges, and to weakened and relaxed conditions of particular parts. They are often prescribed in hemorrhages of different kinds, as hemoptysis, hematemesis, hematuria, menorrhagia, etc.; but they are more particularly recommended in hemorrhages of a passive character. When there is an atonic state of the vessels, the blood escapes by transudation through their relaxed walls; these agents increase the cohesion and condensation of the walls of the vessels, and thereby arrest it. In active hemorrhages, when connected with either a phlogistic or plethoric habit, their use is less apt to prove salutary, for they tend to increase the inflammatory condition. If an important organ is under an intense inflammation, it is evident that astringent medication must prove highly objectionable. Under such circumstances, if an active hemorrhage has occurred, the more active of this class of agents should not be used unless combined with sedatives. But it is always advisable to moderate the inflammatory condition of the system by the use of hydragogue cathartics, anodynes, diaphoretics, sedatives, and revulsives, before resorting to their use. In passive hemorrhages, no such preparatory measures are required; astringents may be administered at any time, and their employment will prove highly satisfactory.

In excessive mucous discharges they are very frequently and extensively employed with great advantage. Among the various diseases of this character which may be named, are diarrhea, dysentery, leucorrhea, etc. In these diseases, if there is active inflammation, with much febrile excitement, their use will be highly improper. This is especially the case in dysentery; in this disease the vitiated accumulations in the upper parts of the intestinal canal should be removed, and the morbid sensibility of the bowels subdued, as well as the high grade of inflammation and febrile excitement, before they are administered. If this is not done, they increase instead of relieving the disease. They are used with much advantage in diarrhea resulting from debility or chronic irritation; when it arises from acute inflammation, however, they are contraïndicated.

Leucorrhea is another disease in which there is generally a relaxed or atonic condition of a local or specific character, and not unfrequently connected with an enfeebled condition of the whole system. In the three diseases of the mucous membrane last named, this class of remedial agents, if properly selected, and properly timed as regards the intensity of the local or general excitement, will often prove singularly efficacious. They seem to condense the atonic fiber, diminish the size of the morbidly enlarged capillaries of the diseased parts, impart tone and vigor to the weakened and relaxed tissues, and in this way arrest the debilitating discharge. They act as topical tonics, and in local debilitated conditions like the preceding, they are of no small importance as auxiliaries to the use of tonics.

Astringents have also been used with much advantage in *diabetic* affections, in conjunction with emetics, hydragogue cathartics, stimulating diuretics, tonics and counter-irritants. By the use of the latter agents we arrest morbid associations, and direct the vascular and nervous afflux from the kidneys, and fix it alternately upon different points, or divide the excitement between different organs, and thus relieve the kidneys of the undue burden imposed upon them; while the astringent, being carried by the blood to the kidneys, and being excreted through them, constringes the weakened vessels, causes a condensation of the tissues, and thus diminishes the excessive product of the abnormal renal action.

In irritation or chronic inflammation of the bronchial mucous membrane, and even in phthisis, attended with copious and debilitating expectoration, connected with general debility and colliquative sweats, astringents of a mild and sedative character, or even the more active agents of this class, when combined with sedatives, frequently prove of much advantage. They diminish the excessive debilitating discharges, and thus sustain the vital energies of the system. In night-sweats not dependent upon any pulmonic affection but arising from some other local and chronic disease, or from general debility induced by a protracted course of some acute disease, astringents constringe the atonic cutaneous exhalants, and arrest the profuse discharge.

Astringents are very frequently employed as topical agents. They are used in *gonorrhea* after the acute inflammatory symptoms have been subdued by other measures; if they are resorted to in the early stages, before a suitable preparatory course of medication to lessen the inflammation, they often aggravate the disease, and often produce chordee, strictures, orchitis, etc. If the milder and less irritating astringents are used, in conjunction with anodynes and demulcents as injections, they will in many cases afford great relief, and exert a decidedly sanative influence over the disease.

Ophthalmia is another local affection in which they are used with occasional benefit. In the chronic form of this disease, after the pain has abated, and when the capillary vessels are left in an atonic condition, mild astringent collyria may be resorted to with a fair prospect of restoring the relaxed vessels to a healthy state, and arresting the profuse secretion. They will, however, prove highly injurious, if employed during the early stages of the inflammation; in this stage mucilaginous and sedative collyria, with emollient poultices, together with hydragogue and refrigerant cathartics, revulsives, etc., are most important.

In *apthæ*, in the anginose affections, as angina maligna, scarlatina maligna, or in any variety of angina, after the acute stage of inflammation has been moderated, they have proved useful. In all cases where there is extensive ulceration with a tendency to putrescence, the vegetable astringents are of unquestionable importance. They act as topical tonics and antiseptics, and should be freely used, either in conjunction with stimulants, or without them, as the case may seem to demand. They may be used in relaxation of the palate and elongation of the uvula with advantage. They are employed either in powder or as a gargle.

Astringents are also used as topical applications in prolapsus uteri, and prolapsus ani. In these cases they seem to condense the relaxed tissues, and arrest the abnormal mucous secretion resulting from the relaxation. Prolapsus uteri, in a large majority of cases, is dependent upon a loss of tone and relaxation of the vagina, and by using these agents in combination with tonics as vaginal injections, we give tone and strength to this canal, and remove the disease. The injections should be used three or four times a day, and employed cold if the condition of the patient is such that they can be used in this way.

They also claim our attention as curative agents in hernia. This disease always arises from a weakened state of some particular portion of the abdominal parietes. The important indication to be fulfilled is to harden and condense the weakened tissue, in order to enable it to oppose the necessary barrier to the advancing abdominal contents. This opposing force is sometimes acquired by the frequent application of strong vegetable decoctions to the part, or by the use of plasters made of some of the most energetic astringent extracts.

They are important in the treatment of old, irritable, flabby and ill-conditioned ulcers. They are frequently applied in the form of a lotion to the ulcer, and at the same time as a poultice. They may be pulverized and mixed with the ulmus or althæ, and made into a poultice by simmering in milk, or even in water; or a strong decoction may be thickened with the ulmus, or with wheat or rye flour. They give tone and renewed vigor to the weakened vessels concerned in the ulcerative process, and increase the strength of the granulations.

Their general external application in the form of baths, yet remains to be noticed. The extensive use which we have made of them in this form, and the happy results which have attended this mode of employment, have given us a very high opinion of them as external medicaments. In adynamic fevers, and, indeed, in the advanced stages of all fevers, when there is extreme debility, they may be freely applied to the surface, by bathing, with great advantage. When there is great prostration of the vital powers, attended with profuse and exhausting colliquative sweats, and when the most potent stimulants and tonics fail to maintain the sinking powers of the system, we may then resort to astringent decoctions—either alone or in combination with stimulants—and apply freely and frequently to any part of the surface with brisk friction, with great advantage. They constringe and give tone to the cutaneous capillaries, and sudoriferous glands and ducts, and thus arrest the exhausting sweat; and their influence, conjoined with the brisk friction applied to the surface, frequently arouses the sinking energies of the system, and effects a reaction, which, if maintained by other medicine, may often result in a cure; and often an important cure may be ascribed to astringents thus used.

In many chronic diseases they are also of great importance when used in the same way. In *marasmus*, *tabes mesenterica*, *phthisis pulmonalis*, *scrofula*, in *dyspepsia* when of an obstinate character, in *chronic rheumatism*, and in many other chronic diseases, especially if attended with great debility and emaciation, a strong decoction of white oak or hemlock bark, applied once or twice daily, or two or three times a week, with brisk friction, will prove a powerful auxiliary measure in the cure of these very obstinate diseases.

Spirits may be added to the astringent bath, or the alkaline bath may occasionally precede it. These modifications and changes will frequently give increased value to the application. It seems to be a very powerful and valuable mode of medication. It lessens excessive nervous sensibility and irritability, by imparting tone to the entire system, and aids in breaking up morbid associations and cachetic habits. Those who have not tested the utility of this mode of employing astringents in the cases alluded to, and others analogous to them, may be disposed to undervalue them, but a fair trial will convince any one of their importance.

If astringents are long continued, either as internal or external agents, their general tendency is to lessen the sensibilities of the parts with which they come in contact, and augment their density.

DIVISION VI.

CLASS XII.

EXPECTORANTS.

Expectorants are agents which promote the evacuation of mucus from the respiratory organs. This they may do by allaying inflammation of the mucous membrane, which in its first stages always diminishes or suppresses the normal secretion of mucus; or by stimulating this membrane when relaxed, causing an increased flow of blood to it, and increased action of the mucous follicles; by rendering it thinner and less viscid, enabling the patient to bring it up; or lastly, by exciting an action of the respiratory muscles, causing an evacuation of mucus already secreted, as in the act of coughing or vomiting.

This secretion is very materially influenced by a variety of pathological conditions of the general system, as well as of the pulmonary mucous membrane. Thus a high grade of fever will as certainly diminish the pulmonary secretion, as a local inflammation, while an asthenic condition of the system will increase it. It is modified by acute as well as chronic pulmonic inflammation; by spasmodic action of the air-passages; by irritation of the innumerable ramifications of the pneumogastric nerves; by a paralysis of the nerves distributed to these organs; or, lastly, by disease of contiguous viscera, the heart, stomach and liver. These various conditions influencing this secretion, clearly demonstrate the necessity of properly discriminating between the diversity of pathological states existing, before recourse is had to the more active agents of this class.

Action of Expectorants.—A question of much interest to the pathologist, as well as the therapeutist, is, how do these agents termed expectorants act? Do they act specifically upon the respiratory organs, or do they act indirectly upon them in promoting the secretion and discharge of mucus? If we except the various topical expectorants, or inhalations, we may regard them mostly as indirect agents. It can not, however, be denied that some of the balsams, the garlic, onions, asafœdita, etc., when administered are absorbed, and excreted from the blood through the lungs. This is proved by the odor which they impart to the breath, though this is but their volatile principle. This may, however, exert some specific influence upon the respiratory passages in its transmission through them, by stimulating the pulmonary exhalants; but the general rule that the sanative action of expectorants is indirect, remains uninfluenced by this admission.

As has been already stated, the diversity of the pathological conditions of the general as well as pulmonic systems, require very different agents at different times, to fulfill the indications. In many cases, difficult or deficient expectoration depends upon an acute inflammation of the pulmonary mucous membrane. In these cases it is evident that whatever tends to lessen the inflammatory action, must tend to produce more copious secretion and expectoration. Hence we find nauseant and emetic expectorants of much value in such cases. If we administer nauseants, they act as sedatives, diaphoretics, antispasmodics, and may produce emesis, if given in sufficient quantities. By their sedative influence they control the action of the heart, and thus diminish the quantity of blood sent to the respiratory organs; by their relaxant powers they tend directly to lower the inflammation and remove the constriction of the mucous membrane; and acting as diaphoretics they equalize the circulation, and exert a powerful revulsive influence. Though these agents are among our most efficient expectorants, yet it is evident that they act indirectly upon the respiratory organs. Cathartics, emetics, diaphoretics, etc., by their sedative, depletive and revulsive influence, equalize the circulation, and thus act as indirect expectorants, in this condition of these organs. Topical revulsives, though local and indirect in their action, may often, by exciting a new point of irritation, relieve the determination to the lungs and increase the mucous secretion. Again, sedatives, as the veratrum viride, gelseminum, aconite, etc., by their power over inflammatory action, often prove our most efficient expectorants in acute inflammation. In short, whatever tends to diminish the inflammatory condition, tends to promote expectoration if diminished from this cause; while expectorants of an excitant character are contraïndicated.

If, however, the inflammation has been subdued by proper medication and the secretion of the bronchial mucous is profuse, and the vital powers are not adequate to the task of throwing off the mucus, we derive much advantage from the use of agents of an exciting and sustaining character, such as the balsams, myrrh, asafœtida, gum ammoniacum, etc., either alone or united with some of the milder tonics, in facilitating expectoration by their stimulant effect upon the mucous membrane, and by imparting vigor to the respiratory muscles.

Cases of extreme debility of the general system sometimes occur in persons advanced in years, or as the result of protracted disease, in which the mucous membrane and follicles lose their tone and give rise to a profuse secretion. The catarrhal affections of old age, cases of humoral asthma, chronic bronchitis, etc., are examples of this kind. In such cases as these, if the general health is improved, and such agents employed as will condense and give tone to the relaxed mucous membrane, as tonics and astringents, the amount of fluid secreted will be greatly diminished, and the process of expectoration will be greatly facilitated by the increased vigor imparted to the muscles. In this way some of the stimulating expectorants, and even tonics, may restrain the secretion when profuse, and promote it when scanty.

Suppressed or diminished expectoration may also arise from a torpor of the mucous membrane and follicles of the air-passages. In this case some of the more stimulating balsamic agents, as the balsams of Tolu or Peru, myrrh, the terebinthina, etc., whose active properties seem to be readily absorbed, and pass off through the lungs, may be resorted tc with a prospect of advantage. If any agents, except medicated inhalations, exert a direct action upon the lungs, these may be included in that list; they stimulate the mucous membrane, cause an increased flow of blood to it, and thus cause an increased secretion and excretion.

In spasmodic disease of the respiratory organs, the mucous secretion is nearly always much diminished or entirely checked, as in asthma. Here a different class of agents are applicable; all those that act as antispasmodics, and relax the spasm of the air-passages, prove expectorant.

The physician is often called to prescribe for cases of harrassing and protracted cough, unattended with any considerable expectoration, arising from an irritation of the mucous membrane of the air-tubes, or from some fixed irritation of the pneumogastric nerves. In these cases the use of narcotics, as opium, morphia, hyoscyamus, etc., are found to be the most effectual agents, when given internally, in allaying the irritation and cough; while other narcotics used as inhalations, as the tobacco, stramonium, etc., are found, in many instances, to be very valuable, and even in many cases sufficient to speedily arrest it. Spasmodic asthma, spasmodic croup, and spasmodic coughs in general, are easily arrested in many cases by the use of inhalations.

There is another source of fixed irritation in the lungs which requires to be noticed; we allude to the presence of tubercles in the lungs. In this case the tubercle maintains a constant irritation, which gives rise to incessant cough; the mucus is discharged as soon as secreted, and before it accumulates in the lungs to even a limited extent; hence the appearance of deficient expectoration; whereas, if the irritation is allayed and the frequency of the cough abated, by the use of sedatives and narcotics, the mucus will accumulate, and when expectorated, will give the appearance of increased expectoration. In tuberculous disease, agents which increase the secretion of the mucous membrane should never be used; for no good can result from their employment, but much injury. The disease is a disease of the blood; it not being duly elaborated, owing to a deficiency of the vital powers of the system, and the deposit of tubercle is but the result of this defective vitalization. Even if the tubercles could be removed by the expectoration, the cause still existing they would still be deposited. Not only do we derive no benefit from these agents, but they directly increase the debility of the system, and thus increase the disease. If there is any cure for tuberculosis, it is to be accomplished by allaying the irritation of the lungs, and by increasing the quantity and quality of the blood,—directing our remedies to the cause, and not to the symptoms of the disease.

There are numerous cases of coughs arising from irritation of the fauces, larynx or pharynx. In such cases *demulcents* may be used freely and with advantage. They allay the local irritation which excites the cough, and by their continuous use for a short time the irritation is removed. They are also beneficial in other cases, where the cough arises from an irritation of the mucous membrane of the lungs and bronchia. Their soothing influence upon the fauces and mucous membrane generally, with which they come in contact, is extended both by contiguous and continuous sympathy to the mucous membrane of the air-passages, and thus they allay irritation and abate the cough.

Expectoration is often facilitated by the act of vomiting. Emetics relax the pulmonary and cutaneous constriction, promote the secretion of mucus, and facilitate its discharge by compressing the thoracic viscera during the act of vomiting. Their influence is often very beneficial in the treatment of various pulmonary affections.

Before closing our description of the therapeutic action of this class of agents, we deem it proper to advert to the salutary effects of *topical expectorants* or *inhalations*. By the use of inhalations of a soothing, relaxing and anodyne character, in cases of inflammation or irritation of the bronchial mucous membrane, great relief is often experienced. If acute inflammation of the respiratory passages exists, inhalations of the vapor of hot water, hot vinegar, hot medicated vapor, as from an infusion of bitter herbs, etc., seems to soothe and allay irritation, lessens the inflammation, relaxes the constricted or spasmodic state of the extreme bronchial ramifications, promotes secretion, and renders expectoration easy. Ether, and some of the volatile oils, are sometimes added to the infusion, which renders the inhalation still more important in some cases. In dyspnea, ether, in which the extract of cicuta has been dissolved, has been used with great efficacy. Camphor has been used with much advantage in spasmodic coughs, croups, asthma, etc.

In cases of extreme irritation of the respiratory passages, attended with spasmodic cough, as in some forms of asthma, or in cases of troublesome cough, arising from an irritation of the pneumogastric nerves, unattended with inflammation, the inhalation of the vapor of some narcotic and anodyne agent, or the inhalation of the fumes of the same article, will, in many cases, give prompt and entire relief. The stramonium, conium, hyoscyamus, digitalis, tobacco, etc., are used in these cases. In other cases there seems to be a loss of innervation of the lungs from partial paralysis of the nerves distributed to them, in which case agents of an exciting character are required. The fumes of boiling or burning tar, resins, feathers, horse hair, balsam tolu and Peru., benzoin, etc., stimulate the nerves, promote the secretion and excretion of mucus, and in this way often give relief. These inhalations are valuable in chronic bronchitis, and other similar diseases.

We have thus seen that the majority of the agents belonging to this class, exert their influence indirectly, and that they should always be selected with special reference to the condition of the respiratory organs and the general system. As Dr. Dunglison remarks, "Almost every division of medicinal agents may become expectorants, according to the precise condition of the system generally, or of the pulmonary organs particularly; and hence we find an expectorant effect equally from depletives, and from tonics and excitants, from narcotics and counter-irritants, and from nauseants and emetics."

DIVISION VII.

CLASS XIV.

ANTISEPTICS.

By the term antiseptic is meant any agency which counteracts sepsis or putrefaction. Those agents, therefore, which are supposed to possess the power of destroying or counteracting the septic or putrescent tendency in the system, are termed *antiseptics.*

This term is so frequently employed by our standard writers on materia medica and therapeutics, to designate a property of medicines, without defining what is meant by such property, or why certain agents act in this manner, that we have ventured upon an innovation in this work, which many may think is not demanded by the present state of medical science or the wants of the profession. Whatever may be the views of others upon this subject, we deem a description of the agents supposed to possess this property, their mode of action, and adaptation to the relief of those states of the system termed septic or putrescent, of sufficient importance to warrant a chapter on this subject.

That there does exist in many instances during the progress of disease, a tendency to putrefaction or rapid decomposition within the system, no physician we think will pretend to deny. Sometimes this tendency exists in the whole system; as is evinced by the general atony and extreme debility that prevails; by the vitiated state of all the secretions; by the dissolved state of the blood; by the cadaverous effluvia escaping from the body of the patient; as well as by the languid and unequal circulation, involuntary discharges, and many other symptoms unnecessary to name. These symptoms are observed in the malignant fevers, especially in the aggravated forms of typhus and typhoid, and in some cases of scarlatina maligna, and confluent small-pox.

Gangrenous erysipelas, puerperal fever, many local injuries, surgical operations, etc., may be adduced as instances of local disease in which a septic or putrescent tendency often exists, rendering specific treatment for its counteraction indispensable.

For convenience, and the better understanding of this subject, we will make the following division of this class of agents: 1. Tonic antiseptics; 2. Stimulant antiseptics; 3. Astringent antiseptics; 4. Chemical antiseptics.

Hooper does not recognize the two latter divisions—astringent and chemical agents; while he adopts two other classes—the antispasmodic and refrigerant antiseptics. The antispasmodic antiseptics that he names,—camphor and asafœtida,—prove serviceable, as we believe, by their stimulant properties, producing a temporary exaltation of vital action, and not by that influence usually termed antispasmodic; and therefore we regard such a division as erroneously founded. His division of *refrigerant* antiseptics likewise appears to be erroneous. Those agents which he names under this division, to wit, acids, counteract a septic tendency; but the question is do they do so from their refrigerant action. We think that this effect is due in part to their restorative powers, and in part to their chemical influence.

We can not therefore regard the division of this class of agents into antispasmodics and refrigerants, as being based on a correct pathological view of septic diseases, nor of the therapeutic action of these agents. Although there may be objections urged against the views which we hold upon the subject, yet we believe they will be found to accord better with our present knowledge of medical science, than any others which have heretofore been advanced.

I. *Tonic Antiseptics.*—As a septic tendency is unquestionably connected with, or directly dependent upon a depressed state of the vital forces, whether the depression be general or local, it is obvious that those agents which tend to increase the strength and vitality of the system, are those upon which much if not our chief reliance should be placed.

Tonics having this power, have accordingly been exhibited with great freedom to ward off or counteract the existing or anticipated morbid state or septic condition. Hence the use of the Peruvian bark and its preparations, the cornus florida, hydrastis, etc., in such cases. Many of the tonics possess stimulant and astringent qualities also, to which undoubtedly may be ascribed additional antiseptic powers, whether the agent be employed as a general or topical remedy.

By increasing digestion and assimilation they furnish a healthy material for the formation of blood; and it is probable that they also exert a direct influence when in the blood, upon those parts of it which have not yet lost their vitality—preventing the progress of the septic tendency. Any measures that will increase or give strength to the vital force of the system, enabling it to resist chemical changes, will prove most powerful antiseptics.

II. *Stimulant Antiseptics.*—Stimulants prove antiseptic in a similar manner to tonics: that is, they temporarily increase innervation, and thus strengthen the vital powers of the system. The extreme depression produced by a septic condition of the blood, depends in part upon its paralyzing influence upon the nervous centers; stimulants counteract this depression by giving rise to an increased evolvement of nervous energy. These agents, however, to prove beneficial, should be combined with tonics, so that the favorable impression produced may be rendered permanent.

They also give an increased *vis a tergo* to the circulation, and probably by this means they may favor the excretion of the morbid material. In this way brandy, wine, and other alcoholic liquors, as well as many of the vegetable stimulants, as serpentaria, myrrh, capsicum, camphor, etc., prove beneficial.

III. *Astringent Antiseptics.*—This division is not as well marked as the preceding, but there are so many articles possessing this property whose principal action seems to be owing to their astringency, that we have thought the arrangement here adopted fully warranted. These agents are principally used topically. Of this class we may name the barks of the different species of oak, hemlock, the sumach, marsh rosemary, wild indigo, etc. Perhaps many of the agents employed for this purpose, and belonging to this division, are dependent for their value, in part, upon some tonic or stimulant influence which they may exert. The mineral agents, as the sulphate of zinc, alum, etc., used as antiseptics, may likewise owe part of their influence to their astringent and stimulating properties, as well as to their chemical influence.

Astringents act as topical antiseptics by causing a condensation of the relaxed tissues, and imparting a normal degree of tone to the parts.

IV. *Chemical Antiseptics.*—The antiseptic action of many remedies can not be accounted for in any of the three ways named; and the question now arises, how do such agents operate? We have no doubt that they act chemically upon the parts undergoing decomposition, although it may be impossible to give a clear and philosophical explanation of this intricate subject.

Sepsis or decomposition is a chemical change, a breaking up of the complex molecules which form our bodies, and the formation of less highly organized and vitalized compounds. So long as the vital force exists in normal strength, this chemical change is held in check; it is exerted just far enough to break down the worn-out tissues of the body. But as soon as the vital force is greatly weakened, this chemical change assumes greater intensity. "The influence of poisons and of remedial agents on the living animal body evidently shows that the chemical decompositions and combinations in the body, which manifest themselves in the phenomena of vitality, may be increased in intensity by chemical forces of analogous character, and retarded or put an end to by those of an opposite character; and that we are enabled to exercise an influence on every part of an organ, by substances possessing a well defined chemical action."—(*Liebig.*)

Having established the point that there is a chemical action going on incompatible with the living principle or laws of life, is it not self-evident that any agent possessing a sufficient degree of chemical power to counteract the existing change, will arrest putrescency. If there is a putrescent or septic secretion, the chemical agent may neutralize and destroy its poisonous action upon other parts, as fast as secreted, and thus prevent the propagation of the septic tendency.

Among the many agents belonging to this division may be named the mineral acids, pyroligneous acid, creosote, sulphate of zinc, chlorine and its salts, carbonic acid gas, niter alum, carbo ligni, yeast, alcohol, sugar, etc. That some of these agents act in other ways is not to be denied; nevertheless their chemical action is believed to be the most important.

In Hooper's description of antiseptics, although he does not positively ascribe their curative powers to their chemical action, yet the reader can not but infer from the following quotations, that such are his views respecting some agents at least.

"The presence of air, though not necessary to putrefaction, materially accelerates it; and those gases which contain no oxygen are very efficient in checking, or altogether preventing the process. Carbonic acid also remarkably retards putrefaction; and if boiled meat be carefully confined in vessels containing that gas, it remains unchanged for a very long time, as seen in Mr. Appert's method of preserving meat."

"There are many substances which, by forming new combinations with animal matter, retard or prevent putrefaction: such as chlorine, and many of the saline and metallic compounds; sugar, alcohol, volatile oils, acetic acids, and many other vegetable substances, also stand in the list of antiputrefactives, though their mode of operating is by no means understood."

The earths and salts are antiseptics, and probably act by absorbing the acids formed in the process of putrefaction. Carbon or charcoal of wood is one of the most powerful antiseptics, and probably not only acts by preventing oxygenation of organized matter, but also in a manner similar to that just described above. It will restore tainted meat, and purify offensive water. Casks are now charred to contain water on long sea voyages, and it will continue pure and sweet in them for a long time. Charcoal in powder is successfully used in the cure of looseness of the bowels, and it has been known to cure intermittent fever.

Carbonic acid, chlorine, the saline and metallic compounds, acetic acid, etc., to which reference is made in the above quotations, are denominated antiputrefactives, and if so, how do they act, if not chemically? The new affinities which arise from their application, and the new combinations formed by their union with the products generated by decomposition, may so change the character of the decomposing material, as to prevent the communication of the destructive process to the still vitalized tissues. That such chemical changes and reactions do occur in the body is not doubted; and to this action, and this alone, are we to refer for a satisfactory explanation.

"Warmth, air and moisture," says Pereira, "are the most powerful agents in promoting putrefaction, and their exclusion, therefore, is among the most effective antiseptics. Thus, cold, a vacuum and desiccation, are good conservatives of dead organic matters. Alcohol, sirups, fats and volatile oils are antiseptics; all act by excluding air, and some of them (alcohol) likewise by abstracting water from the organic matter."

DIVISION VIII.

CLASS XV.

EMMENAGOGUES.

Emmenagogues may be defined to be those agents which promote the menstrual secretion, either by a direct or indirect action upon the uterine organs. Many of the most respectable authorities doubt the existence of agents which act directly upon the uterus, and contend that the reputed emmenagogues act indirectly upon this organ. Many agents of this class act as general excitants to the whole system, and from this general excitation the menstrual secretion is often promoted. Again, a number of these agents act upon contiguous organs, and produce a determination to, and congestion of the pelvic viscera, and thus indirectly exert an influence over this secretion.

It would seem that the female organism possessed the power of elaborating the materials of nutrition in greater abundance than it required to supply its continued waste, and the redundant portion, it would seem, passes off in the menstrual secretion, except during the period of pregnancy and lactation, during which time the superabundant portion of nutritive matter goes to supply the materials for the reproduction and sustenance of a new being. The health and enjoyment of the female seems to be very intimately interwoven with the normal condition of this periodical secretion, from the period of puberty to the cessation of the discharge; its suppression or retention being almost invariably followed by disease of a more or less aggravated character.

Amenorrhea is that disease or state of the system which arises from a retention or suppression of the catamenia.

This abnormal condition may arise from very opposite conditions of the system; and, indeed, it occurs under such a contrariety of circumstances in respect to plethora or anemia, debility or tonicity, and requiring such dissimilar remedies to reproduce the secretion, that it is by no means strange that writers should question the existence of any direct emmenagogue agents. Under certain circumstances, one agent or class of agents will seem to promote the secretion; while under other circumstances, and when a train of very different symptoms are present, a remedy entirely unlike or opposite the former one, will prove emmenagogue.

Action of Emmenagogues.—We think that all of the agents that prove emmenagogue act in one of the following ways: 1. They may act as sedatives, diminishing the force of the circulation, and the vascular irritation or active congestion of the uterus. 2. They may cause a determination of blood to the pelvis, and produce that congestion of the uterus necessary to the production of the secretion. 3. They may increase the quantity and quality of the blood, when amenorrhea depends upon anemia. 4. They may act upon the uterus through the nervous system, stimulating it to increased activity.

1. In females of a plethoric habit, when suppression of the menses has resulted from cold or other causes, there is always an active congestion of the uterine organs, a state bordering on inflammation; and owing to the retention, there is vascular repletion, and consequently more or less excitement of the circulation. In this condition, such agents as allay the vascular excitement, equalize the circulation, and relax the system, prove emmenagogue. Thus the refrigerant hydragogue cathartics prove advantageous by causing a determination to the bowels, and by diminishing the vascular repletion. The warm pediluvia and the hip-bath prove advantageous by their relaxing effects upon the system. Nauseants are employed for the same purpose, and for their sedative influence. These different measures combined, generally prove effectual in restoring the menstrual secretion in this condition of the system; and they do it by diminishing that active determination to the uterus which has been the cause of the suppression.

2. In certain cases suppression or retention of the menses may be caused by a torpor of the uterus; it does not receive a sufficient supply of blood to furnish the secretion. In such cases, agents that cause a determination of blood to the pelvis, act as emmenagogues. Hence those drastic cathartics that act especially upon the lower part of the large intestine, as the black hellebore, aloes, gamboge, savin, etc., produce the necessary congestion.

3. When retention or suppression of the menses is dependent upon an anemic condition of the system, as is often the case, iron and the bitter tonics, by increasing the quantity and quality of the blood, until there is sufficient for the formation of the secretion, prove our most efficient emmenagogues.

4. When amenorrhea is dependent upon deficient innervation, all other conditions being present, then such agents as act as stimulants to the organ will reproduce the secretion. Of the measures employed in this way, probably none act as directly as *electricity*, the current being passed through the uterus; this has been known to reproduce the secretion in a very short time. The black cohosh, blue cohosh, guiacum, madder, savin, rue, borax, etc., probably act in this manner, as we have direct evidence that they do act in certain conditions as direct stimulants to the uterus.

CLASS XVI.

PARTURIENTS.

A PARTURIENT may be defined to be an agent which acts upon the uterus, increasing its contractile powers, arousing it to renewed action when the pains and propulsive efforts have subsided, or when they still continue their regular occurrence, but have become insufficient for the accomplishment of the labor.

"Various specific remedies," says Dr. Ramsbotham, "have been recommended at different times, to increase the parturient throes, and facilitate the child's birth; but I believe that the whole of these substances, one only excepted, act upon the womb through the excitement induced in the arterial system. They first stimulate the nervous, then the arterial systems, and through the medium of these the uterus. Almost the only medicine now used as a uterine excitant, is the *ergot of rye;* and I have no hesitation in declaring my opinion that its action is specific, and that the uterus is not affected through any disturbance first set up in the arterial system."

This opinion of Dr. Ramsbotham is supported by the best authorities of the present day, though some add to the list of specific agents *borax*, *rue*, *Indian hemp*, *gossypium herbaceum*, and the *black and blue cohosh.* From our investigation of the parturient powers of these remedies, we should be inclined to believe that if they have any such action, it is at best but feeble, and probably *indirect.* It is generally admitted that any arterial stimulant, especially if given in a fluid form, so as to act as a diluent, will in some cases increase the contraction of the uterus. In this case they act *indirectly*, by causing an excitement of the entire system, in which the uterus sympathizes. We have no doubt that even warm diluents will sometimes increase the contraction of this organ. For instance, the *warm ginger tea* so frequently recommended and even forced on patients by nurses; though in some cases we have thought they retarded the labor. The Indian hemp was tried in a few cases by Dr. Simpson, and of its action he says: "In the few cases of labor in which it was tried, parturient action seemed to be very markedly and directly increased after the exhibition of the hemp; but far more extensive and careful experiments would be required before a definite opinion could be arrived at relative to its possession of oxytoxic powers, and the amount of these powers." Borax has had considerable repute as a parturient, especially in Germany; but authors of the present day generally coincide in the opinion that if it does possess any such power it is very weak. The parturient powers of the gossypium rest entirely upon hearsay evidence; it is reported to be used by negresses in the South for this purpose, and for procuring abortion; but as yet we have seen no such effects from its use in our practice, and we have yet to learn of a case in which they were well substantiated. The two species of cohosh named, have long been considered as possessing this property; but we feel inclined to doubt it, notwithstanding the favorable reports in regard to their use.

"Every one," says Dr. Dunglison, "who has practiced extensively in obstetrics, must have observed that the parturient efforts occasionally flag, and, indeed, are wholly suspended; yet they recur, and the labor proceeds rapidly to a favorable termination; and if in any such case a remedy presumed to be a parturient, were administered during the period of the cessation of pain, the recurrence of the pain in this sudden manner, could hardly fail to be ascribed to the administration of the presumed parturient. Let the obstetrical practitioner, who has never had recourse to any such agent, call to mind how few the cases are in which delivery has had to be aided, in consequence of the *total* cessation of the pains, and how common it is to meet with a partial or temporary cessation, and he will see that the absolute necessity for the use of a parturient is not a common occurrence."

We may, then, justly divide parturients into two classes, the *direct* and *indirect;* the first consisting of one, possibly of two or three agents; the second consisting of several remedies, and other measures which exert an influence over the gravid uterus through their general effects upon the system.

Ergot being the type of the *direct* parturients, if not the only one, our next inquiry is as to its mode of action. Here we find a difference in the opinion of authorities; for while some consider it as a special stimulant, others class it with sedatives. "Ergot of rye," says Headland, "is a stimulant to the muscular nerves of the uterus in the female, but to no other nerves in any marked degree. Borax and rue possess a similar action, but are not so efficient. When given in an over-dose, ergot has a dangerous action on the brain, producing at some times narcotism, at others syncope."

Direct parturients may be administered with advantage, when there is inefficient uterine action,—the pains being weak, the intervals between them distant, the space of time during which they continue short,—and if the labor has already continued for a considerable length of time; providing there is no disproportion between the pelvic cavity and head of the child, the os uteri is fully dilated, or very dilatable, and there is no rigidity of the soft parts. In speaking of ergot, Dr. Ramsbotham says: "It must not be given in any case where the lingering labor depends upon a mal-position of the head. It may be admissible occasionally in breach presentations, but in no case of transverse-position of the fetus, provided the term of gestation is nearly completed, should we ever contemplate administering ergot. It must only be given in cases where the sole cause of delay is a torpid or feeble state of the uterine action, or where it is desirable to terminate the labor speedily—and that too by means of the natural powers—in consequence of hemorrhage." This agent is also recommended in hemorrhage following parturition, from inversion of the womb, from the retention of the placenta, or a portion of it, or firm clots of blood; and also in intra-uterine polypi, in order to excite a forcible contraction of this viscus, and the expulsion of its contents.

Of the *indirect* parturients we may notice the influence of *stimulants*, of *warm diluents*, of *friction*, and *change of posture or exercise.* Stimulants, as already stated, prove parturient by the general excitement which they produce; they are indicated when there is much prostration, when the pulse is slow and feeble, the uterine contractions powerless; while, at the same time, there is but little loss of blood.

Warm diluent drinks are the simplest agents that can be used, and are frequently apparently successful: if the stomach does not reject them, and they are grateful to the patient, they may always be allowed. Friction over the uterine globe is frequently successful in increasing the frequency, length, and intensity of the pains, and may be resorted to for this purpose. Change of posture, or exercise in the room, when not contra-indicated, is a very efficient means of stimulating the contractions of the uterus. It also gives relief to the patient to change her position, sit up, or walk in the room, as her own inclination dictates.

CLASS XVII.

ABORTIVES.

ABORTIVES are those agents which are capable of producing an abortion or miscarriage in pregnant women. They are supposed to exert a specific influence over the gravid uterus, and to be capable of inducing uterine contractions, and effecting the expulsion of the fetus. We think that this class of reputed agents might with much propriety be stricken from the materia medica. That certain agents are capable of producing abortion, and do, under particular circumstances, have that effect is not denied, but that they produce it by virtue of any specific influence exerted upon the uterus under the ordinary circumstances of their administration, is very questionable.

Those agents which do produce abortion, act as very powerful stimulants or irritants. By the violence of their action upon the system, and especially upon the pelvic viscera, they incidentally excite the uterus to contraction, and cause the expulsion of its contents. Emetics, drastic cathartics, active stimulants or excitants, vesicants, stimulating diuretics, etc., not unfrequently induce abortion in this manner. Lifting, riding, leaping, over-exertion, excessive venery, sudden fright, or any strong mental emotion, excessive use of stimulants or condiments, scanty and innutritious diet, may each in its turn, and under certain circumstances, produce the same result.

Ergot is said to be an abortive by some, while others deny it, and say that it acts only upon the uterus during the process of parturition. It is claimed by others that this agent acts upon the uterus at any time, whether in its gravid or non-gravid state. The action of this agent, however, has been already fully considered.

There are other articles spoken of as abortives, but for the reasons above given, and as these articles are all referred to, and their properties given in the description of other classes, we think it enough merely to name them in the present instance. The reputed abortives are, the savin and its oil, oil of tansy, rue and its oil, actea alba, gossypium, asarum canadensis, black hellebore, etc.

No agent of this class can be administered with any prospect of safety, for the production of abortion; their action in almost every instance produces severe uterine inflammation, or such a loss of power that uterine hemorrhage is the result.

DIVISION IX.

CLASS XVIII.

ANTISPASMODICS.

ANTISPASMODICS may be defined to be those agents which counteract spasm. They may be justly divided into two classes, the *direct* and the *indirect*, though we have no positive proof that there are any agents possessing direct antispasmodic properties.

The mode in which these agents act is involved in much obscurity. So much so, that very different views are held by different authors. By some they are classified with narcotics, others class them with diffusible stimulants, others with special stimulants, while others again have determined that they are sedatives, admitting at the same time that their first effect is stimulant.

Action of Antispasmodics.—In attempting to solve the problem, of how this class of agents act, we will first have to notice the cause of convulsion or spasm. Spasm may arise in two different ways; first, as an exaltation of the natural irritability of the muscular fiber; and second, from an irritation of the nervous centers.

Muscular fiber is endowed with the peculiar property of *irritability*, or contraction on the application of some stimulant. This property may be either increased, or diminished. In the first instance we may have an excessive contractility or spasm, from the influence of a slight stimulus; we have an example of this in the irritability of the bowels in *lientery*, where the action is so rapid that the food is passed through the intestines so rapidly that it can not undergo the digestive process. Again we have it in the *tonic* spasm or *cramp*, in which the contraction is not alternated with relaxation. "Such spasms," says Dr. Williams, "are not unfrequently felt in the calves of the legs; and in the different muscular canals, the gullet, the stomach, the intestines, and the glottis, which occasionally present this state of continued contraction. In most of these cases, it is accompanied by pain more or less severe, and may lead to serious obstruction to the function of the organ. When in a more moderate degree affecting the voluntary muscles generally, it constitutes catalepsy, in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in, until the spasm is over. But the extreme example is *tetanus*, in which the spasms are so violent and so enduring, that they may be said to squeeze the patient to death. The pathological cause may be, either an irregular supply of blood to the muscle, or irritation, direct or indirect, of the motor nerves by which the muscles are excited."

It is obvious that in this case *sedatives* will prove valuable antispasmodics. They lessen the irritability of the muscle, and also its stimulant to action. The efficacy of lobelia and other emetic agents, in the more severe cases of this kind, is to be ascribed in part to its sedative influence, to the severe shock produced upon the system, and to its equalizing the circulation. These, however, are but temporary means, and our main dependence for a radical cure will have to be placed upon such agents as will give tone and strength to the entire system.

The second cause of convulsions or spasms is an irritation of the nervous centers, either *centric*, arising within the nervous matter; or *eccentric*, the irritation being transmitted to the spinal cord from some other portion of the system. Inflammation or other disease of the brain and spinal cord, or their membranes, may give rise to the first variety, as in apoplectic and epileptic convulsions arising from disease of the brain, convulsions arising from spinal meningitis, etc. By an *eccentric* irritation, we understand one that exists in some other portion of the body, but which is transmitted to the spinal cord by the sensitive nerves, and gives rise to a *reflex* action. Such we have in the convulsions arising from teething, from worms, from acrid matters in the alimentary canal, from uterine or renal irritation, etc. Again, we may suppose that the same result would follow from *mal-nutrition*, as we observe in chorea, in some cases of epilepsy, etc. Here, undoubtedly, the disease exists in the blood; it either fails to supply a proper quantity and quality of nutritious matter to the nervous system; or else it contains an irritant material capable of exciting a reflex action of the spinal cord.

"When these phenomena," says Dr. Williams, "are general or extensive, as in convulsions, tetanus and paraplegia, we must refer them to an undue excitement or erythism of the spinal and prolonged medulla; but the more partial examples, as palpitation of the heart, and spasm of the bronchi, from intestinal irritation, etc., may arise from similar excitement of a small portion of it only, or of the incident nerve of the part which occasions the phenomenon, or of the excito-motory nerve of the part which exhibits the phenomenon.

"If we seek to know the causes of this excitement, we shall find that, as in excess of other vital properties, it is sometimes referable to an increased flow of blood through the spinal marrow or its nerves, or the branches of the sympathetic nerve. Thus the early stage of inflammation of the spinal cord or of its sheath, is attended with convulsions or tetanic spasm. It is very probable that the spinal excitement (convulsions) occurring in epilepsy and apoplexy, is in part due to the flow through the medulla being increased in proportion as that through the brain is impeded; a consideration of the causes of convulsive paroxysms, and of the distribution of the vertebral arteries, much countenances this supposition. But in many cases, the excitement seems to be of a more direct nature. Strychnia, in a poisonous dose, excites the medulla so speedily, causing tetanic spasm, that its effect can scarcely be due to increased flow of blood. So, too, we know that mechanical irritation of the spinal marrow, or of its nerves, will cause convulsive motions; and we find this exemplified in the effect of tumors and spicula of bone in the spinal canal, in the head, or in the course of nerves. But nothing exhibits this element of nervous irritation (apart, so far as is yet known, from vascular influence) so fearfully as traumatic tetanus. The irritation here begins in a distant nervous branch, and is propagated to the medullary center, the excito-motory function of which at length exhibits a state of erythism which destroys life either directly by tonic spasm of the muscles of respiration, or by exhaustion.

"Another cause which may be fairly assigned for increase of the involuntary excito-motory property, is accumulation by rest. This causes the augmentation of this property in the medulla, in narcotism from opium, and in injuries of the spine, which suspend the exhausting influence of volition on the whole or part of the marrow, in which the nervous energy therefore accumulates, and becomes unusually abundant. There is a natural increase of this property in sleep, which, by suspending the sensorial functions, augments the energy of those of the medulla; and this accession of power, which maintains the movements of respiration during sleep, also disposes to the occurrence of spasmodic attacks at this time; hence the fits of epilepsy and asthma commonly come on during sleep. So, likewise, sedentary habits and too much indulgence in sleep, may cause an accumulation and morbid excess of involuntary nervous power, and develop convulsive and spasmodic symptoms, which are the result of its overflow.

From what has been stated above, it will be seen that almost all classes of the materia medica may furnish articles which will prove antispasmodic under certain circumstances. If spasm depends upon an irritation of the spinal cord, its membranes or nerves, such agents as tend to remove this irritation are indicated. If it depends upon an unequal circulation, those remedies which counteract this condition will prove useful. If it depends upon an eccentric cause of irritation, as morbid material, worms, etc., in the alimentary canal, the agents that will remove them prove the most valuable antispasmodics. And lastly, if it depends upon the condition of the circulating fluids, this will have to be changed.

The agents generally classed as antispasmodics, as the musk, castor, asafœdita, galbanum, etc., are probably beneficial on account of their gently stimulant and soothing influence upon the system. They are valuable in cases of eccentric convulsions, from the fact that such cases are frequently caused by irritation of the alimentary canal, and these agents allay such irritation. They may probably owe their beneficial effect in hysteria, in part to the same cause; but there can be no doubt but that their slightly stimulant influence, and the impression made upon the mind of the patient, have much to do with their antispasmodic powers.

DIVISION X.

CLASS XIX.

REFRIGERANTS.

Refrigerants are defined to be those agents, which, when taken internally, or applied externally, lessen the morbid temperature of the body. This they may effect in two ways; first, by checking the process of combustion; and second, by the direct abstraction of heat.

Heat is produced in the animal body by the oxydation of certain components of the food and of the tissues of the body; the heat produced bearing a direct ratio to the amount of oxygen consumed, or to the amount of carbonic acid gas exhaled, and water formed by the union of oxygen with hydrogen. Though oxygenation first takes place in the lungs, yet we do not find an increased amount of heat in them, but the reverse; the constant evaporation of water in expiration tending to keep their temperature below some other portions of the system. Arterial blood is a carrier of oxygen, as is proved by its altered color after its passage through the lungs, and this color, the effect of oxygenation, continues until it has passed through the smaller capillaries. In the capillary system, then, we may look for the oxygenation of such material as will answer the process of combustion; and in this system of vessels we doubtless have the evolution of caloric. Heat, then, is very equitably distributed through the body; the parts, however, furthest distant from the center of circulation being somewhat the coolest. We find also that in health the system possesses within itself a regulating power, by which the combustive process is augmented in activity when increased calorification is required, or slackened when the temperature becomes too high. This is accomplished by an appetite for certain varieties of food which furnish a proper pabulum for combustion, and an increased activity of the respiratory organs in the one case, and for articles of diet of an opposite character, and decreased respiratory action in the other.

" The means provided by nature for cooling the body," says Dr. Carpenter, " are of the simplest possible character. From the whole of its soft, moist surface, simple *evaporation* will take place at all times, as from an inorganic body in the same circumstances; and the amount of this will be regulated merely by the condition of the atmosphere, as to warmth and dryness. The more readily watery vapor can be dissolved in atmospheric air, the more will be lost from the body in this manner. In cold weather, very little is thus carried off, even though the air be dry; and a warm atmosphere, already charged with dampness, will be nearly as ineffectual. The skin, as already mentioned, contains a large number of glandulæ, the office of which is to secrete an aqueous fluid; and the amount of this *exhalation* appears to depend solely or chiefly upon the *temperature* of the surrounding air. Thus, when the external heat is very great, a considerable amount of fluid is transuded from the skin; and this, in evaporating, carries off a large quantity of free caloric, which would otherwise raise the temperature of the body. If the atmosphere be hot and dry, and also be in motion, both exhalation and evaporation go on with great rapidity. If it be cold, both are checked, the former almost entirely so; but if it be dry, some evaporation still continues. On the other hand, in a hot atmosphere, saturated with moisture, exhalation continues, though evaporation is almost entirely checked.—We learn from these facts the great importance of not suddenly checking exhalation by exposure of the surface to cold, when the secretion is being actively performed; since a great disturbance of the circulation will be apt to ensue, similar to that which has been already mentioned, as occurring when other important secretions are suddenly suspended."

In febrile diseases the abnormal increase of the temperature may arise from two pathological states of the system;

first, from any cause that will produce increased disintegration of the tissues, a more rapid circulation of the blood, and increased respiratory action, and consequent oxygenation; and second, from any cause that obstructs or diminishes cutaneous transpiration, which is the great *frigorifying* means of relieving the system of superabundant heat. In inflammation the increased heat is probably dependent upon the increased amount of blood sent to the part, and upon the increased chemical changes going on in it.

We have already noticed the fact that if, from any cause, an increased disintegration of the tissues should occur, or if the vitality of the circulating fluids was depressed, either by the retention of an excretion, or other cause, an increased amount of combustible material would exist, and increased oxygenation would be necessary. To burn this and fit it to be eliminated, an increased respiration and rapidity of the circulation would be necessary, and the consequence of this would be an increased evolution of caloric; this gives us the principal symptoms of *fever*.

Action of Refrigerants.—Refrigerants act in four different ways: first, by directly diminishing the process of calorification; second, by the direct application of cold; third, by increasing the action of the skin, thus relieving the system of its superabundant heat; and fourth, by an artificial evaporation from the surface, for the same purpose.

Among the agents that act directly in diminishing the process of calorification, we might call attention to the class of direct sedatives already considered, and to all agents whose secondary action is sedative. A sedative diminishes the generation of heat in the body, by diminishing innervation, by controlling the action of the heart and lessening the rapidity of the circulation, and consequently of the respiratory apparatus. These effects are invariably followed by a reduction of the temperature, as the evolution of caloric in the system requires active innervation, circulation and respiration.

We have another class of agents, however, which, though not as efficient in this particular, yet are designated by the term refrigerants. These are the vegetable and some of the mineral acids, and the supersalts of the vegetable acids.

These agents act, it is probable, in two different ways: First, they furnish a combustible material to the blood, which requires much less oxygen for its combustion than the nitrogenized tissues of the body. Then if the amount of heat evolved bears a direct ratio to the amount of oxygen consumed, these agents would prove direct refrigerants. Dr. Headland says: "In fact, I suppose that in fevers the supply of natural blood fuel is deficient; that the nitrogenized tissues are then oxydized to maintain the animal heat, causing not only wasting, but tending to keep up the fever by the excessive amount of oxygen demanded for this abnormal combustion; that in such a case the vegetable acid is well adapted to take the place of lactic acid, the natural fuel. For though in health the ingestion of such an acid is immediately followed by increased acidity of the urine, when used in fevers it does not pass into the urine. It is then disposed of, or burnt, in the blood." Second, they act as antiseptics, preventing or retarding the chemical changes going on in the blood and solids of the body, and thus directly prevent oxygenation and the consequent evolution of heat. We understand by the term disintegration or decomposition, when applied to the tissues of the body, a chemical change from a higher to a lower grade of organization. Such a change always gives rise to an evolution of heat, as we witness in the *calor mordaux*, or increased heat of the dead body, caused by rapid decomposition. These agents check this disintegration of the tissues, and consequently lessen the morbid heat of the body. Thus they prove very beneficial in typhus or typhoid fevers, and in all low forms of disease in which there is a typhoid or septic condition of the blood.

The direct application of *cold* is among our most powerful refrigerant measures; and not only so, but it is also one of the most agreeable to the patient when there is an excessive generation of heat. In fever, when taken internally, it operates as a direct refrigerant, reducing preternatural heat, lowering the pulse, and disposing to sweating. There are very few cases in which cold water, if desired by the patient, may not be taken in moderate quantities. Even in cholera infantum, where drinks of all kinds, though constantly desired, will be immediately ejected, we have found ice, or ice-water, in small quantities, to be of the greatest utility. The practice of physicians in former days, and even some at this time, of prohibiting entirely the exhibition of cold water, was certainly the most cruel, if not the most unphilosophical mode of treatment that could have been adopted. We have now the most vivid impressions, from actual experience, of what it was to have a fever in those days. Suppose a person with dry mouth, parched tongue—literally burning up—and with a thirst that might be called *horrible*, begging for but a spoonful of cold water to wet his parched lips; yet this was positively prohibited, upon the ground that it would probably kill the patient, or produce "*salivation*." If we had to take our choice between cold water, or a doctor with his lancet, calomel, ipecac, tartar emetic and Dover's powder, the regular saddlebag contents of former days, we should certainly prefer the first and omit the last.

Cold applications are employed with advantage in all inflammatory affections where there is general febrile reaction. In many cases they will be found to give more satisfaction than the "hot fomentations" so commonly employed. The rule that we observe in their use is, that if the system is in such a condition that a chill will not follow their application, and if the part to which they are applied is much above the ordinary temperature, they may be used with advantage; but if the contrary is the case, we apply warm applications. In the first stages of inflammation of the eyes, we may often entirely arrest the disease by the application of cold. Care, however, is required that the cold is not continued long enough to produce such a degree of refrigeration as will endanger the tissues of the eye. In other superficial inflammatory affections, cold may be often employed so as to speedily remove the disease. Cold applications to the head in phrenitis, in determination of blood to the head, etc., is one of the most common means resorted to, yet we have found that refrigeration by evaporation is much the best method of removing the heat in these cases.

Cold applied to the entire surface in febrile diseases, is often an important means of subduing or lessening the abnormal heat of the body. Its *primary* effect is that of a depressing and sedative agent; thus it lessens the heat of the surface, causes constriction of the capillary vessels, lessens nervous irritability, and diminishes the activity of the circulation. If long continued, it causes a determination of blood to internal organs, which are oppressed in their action. Its *secondary* effects (*reaction*) are the opposite of the primary effects: thus, there is determination to the surface, the skin is relaxed, and perspiration frequently results. External refrigerants are generally more effectual than those used internally. They are brought in direct contact with an extensive, highly vascular, sensitive and strongly sympathizing surface, and through this sympathy they exert a sedative influence upon the entire system.

The refrigerant effects of cold, in fevers, are obtained in two ways: by exposing the body to a draught of cold air, or by the application of cold water.

Cold air is frequently beneficial as a refrigerant; if the body is exposed to a draught of cold air, the increased evaporation and consequent refrigeration is grateful and salutary in its influence upon the system. It is necessary, however, that the entire surface should be affected alike; for if the air strikes but a portion of the body, a severe cold, with aggravation of the disease, will be very likely to result. Exposure to the air at a temperature of fifty or sixty degrees, without draught, is much safer, lowering the temperature of the body and reducing excessive vascular action. In febrile diseases, we always direct that the patient be lightly covered when the skin is hot, and, if possible, keep a free circulation of air in the room. We have found this especially useful in the treatment of scarlatina. In the first stages of the disease we keep the patient lightly covered, use the cool alkaline bath, and refrigerants internally; but as soon as the fever commences to subside, we direct them to be warmly covered, and mild diaphoretics administered to produce perspiration.

Cold water is employed as a refrigerant in the form of a *bath*, *affusion*, *shower-bath*, *douche*, *wet-sheet pack*, and as a *wash*.

The temperature of the *cold-bath* ranges from 33° to about 75°; when below 50° it may be considered very cold. Its primary effects are a sensation of cold, paleness of the skin, contraction of the cutaneous vessels and to some degree of those deeper seated, and diminished rapidity of the circulation. This is soon followed by reaction, the pulse becomes full and frequent, there is determination to the surface, with a softened state of the skin and perspiration. It has been employed as a refrigerant in fevers of a sthenic type, and many cases are reported in which it has immediately broken up the disease. Owing, however, to want of facilities to employ it, and the natural objections of patients to such rough treatment it is rarely used.

The *cold affusion*, *shower-bath and douche*, are rarely employed for their refrigerant influence, being better adapted to the treatment of local or chronic diseases (see *Hydropathy*, Part I).

The *wet-sheet pack* is one of the most valuable modes of applying cold as a refrigerant in fevers. Its primary action is the same as the cold-bath,—diminishing the heat of the surface, lessening the rapidity of the circulation, and acting as a sedative to the entire system. Here, however, the analogy between the two ceases; for instead of a high reaction as is the case with the cold-bath, it is generally but sufficient to produce an agreeable degree of warmth; the pulse assumes its natural standard, the skin is relaxed, and perspiration established. We have often seen what promised to be a severe attack of fever, entirely subdued in its incipient stage, by the employment of the wet-sheet pack; and if it were not for the almost insuperable objections of patients to its use, we have no doubt that a majority of such cases would yield to its use with but little medication, if employed in the early stages. After the disease has progressed for some time we should not expect it to prove so decidedly curative, yet it will be found of great utility when not contra-indicated as an accessory means of treatment. The rules that we observe in its employment, are, that when the skin is hot, the pulse quick but not small, and perspiration suppressed, it may be used with advantage.

Sponging the body with cold water, as far as a simple refrigerant is desired, is a valuable mode of application, and much less objectionable to the patient than either of the others mentioned; there is no shock, the fluid being left to evaporate merely cools the surface, and by persevering in its application, the cooling effect is fully obtained and rendered permanent. When water is used in this manner, its temper ature, as a general rule, should be but little below that of the body; but this is best regulated by the feelings of the patient. One great advantage of the *sponge-bath* is the facility of limiting the extent of the effect to the feelings of the patient, and of applying it even when lying in bed; as soon as the patient feels chilly, he should be carefully dried with brisk friction and warmly covered up in bed.

Dr. Thompson notices six varieties of fever in which the refrigerants named are indicated and prove useful:

"1. In inflammatory fever (synocha), a rare disease when unaccompanied with topical inflammation, the advantages to be derived from refrigerants are well understood. The cold affusion is admirably adapted for rapidly abstracting the stimulus of heat, diminishing general excitement, and operating as a powerful sedative. In the more advanced stages of the disease, cool sponging is often substituted for the affusion; but when the patient can bear the fatigue of the affusion, it is always to be preferred. The greater frequency of this form of fever among the ancients than the moderns (?) explains their constant employment of cold drinks and cold bathing in continued fever.

"2. In fevers of a typhoid type, the disease has been cut short by the cold affusion; but in this case more, perhaps, is to be attributed to the shock and the reaction which follows, than to the refrigerant influence of the affusion.

"3. In synochus or inflammatory fever, gradually assuming the typhoid character, refrigerants in general, but more especially the cold affusion, are chiefly applicable to the early stages of the disease; and, indeed, no form of remedy is more advantageous when there are no local determinations; but when these exist, particularly if the lungs be affected, much caution is required.

"4. In remittent fevers, especially those of warm climates, and in their intense and more excited variety, the cold affusion may be employed with great benefit. In severe attacks also, much advantage is derived from the application of ice or cold water to the scalp. In the remissions, however, the application of cold in any form must be suspended. In yellow fever, the safety of the patient frequently depends solely on the early application of the cold affusion.

"5. If hectic be symptomatic of pulmonary affections, or determination to internal organs, the cold affusion is decidedly contra-indicated; but even in such cases much benefit is often obtained by sponging the trunk of the body with cold water, mixed with vinegar, while the lower extremities are kept warm in bed. We must, nevertheless, bear in mind that, under any form of hectic, although general refrigerants are useful auxiliaries, yet the cold affusion can scarcely be regarded as admissible.

"6. In eruptive fevers, except measles, the body should be freely exposed to cool air; and even the cold affusion may be safely and advantageously prescribed, should the state of the surface require it, nor should the presence of the eruption operate as a reason against its employment. The Hindoo physicians plunge their patients, during the eruption of small-pox, into cold water, and with the best results. It diminishes the fever, lessens the number of the pustules, and is said to prevent pitting. The writer of this article has long been in the habit of employing the cold affusion in scarlatina during the hight of the eruption, and has seen the severity of the disease instantly checked by it.

"In intermittent fevers, when the skin is dry and parched, and the general heat greatly augmented, cold in every form applied to the surface, and cold acidulated fluids taken into the stomach, are of the same value as in continued fever, and greatly favor the accession of the sweating stage."

The skin, as has been already stated, is the great refrigerating organ of the system; and when it is in a perfectly healthy condition, its functions being normally performed, it would be almost, if not entirely, impossible for an excessive degree of heat to exist. It must then be apparent that if by any means we can obtain a normal action of this tissue, refrigeration would be the consequence, and the agents employed for this purpose might be termed refrigerants. Thus diaphoretics and diaphoretic measures would become important agents of the class we are now considering. It is not our intention, however, to do more than merely refer to the importance of these agents as refrigerants in this place, as they have already been fully considered. The various external applications referred to not only act as direct refrigerants, but also indirectly in promoting the cutaneous secretion. As a very important mode of cleansing the skin, and stimulating it to increased action, as well as of producing direct refrigeration, we would here refer to the *alkaline bath*, so well and favorably known to Eclectic practitioners. Nothing, with which we are acquainted, so successfully cleanses the skin, removes the detritus of perspiration, and fits it for normal secretion. It is employed in all stages of febrile disease with perfect safety; its temperature being governed by the condition of the system.

Evaporation from the surface is one of the most powerful modes of refrigeration, heat being rapidly conducted from the system by the change of a liquid to a gaseous form. Thus in fevers where the skin is very hot, it may be soon brought down to a normal temperature, by sponging the surface with luke-warm water, and promoting evaporation by a current of air or by fanning. It is not in general disease, however, that it is employed with the greatest advantage. In inflammatory affections it proves more useful than any other form of external refrigeration, rapidly reducing the temperature of the inflamed part. We employ it in phrenitis, determination of blood to the head, etc., in preference to ice or ice-water; for we have found by experience that it reduces the heat as rapidly, is more agreeable to the patient, and there is no liability to that reaction which always follows the application of cold, if by any carelessness upon the part of the attendant, it is not continuously applied. In inflammation following injuries, it will also be found preferable in many cases to the direct application of cold. In some cases, as in injuries of the joints, if we wish to produce a more rapid refrigeration than can be obtained by the evaporation of water, we employ agents that evaporate very rapidly, as the sulphuric ether, chloroform, etc.

DIVISION XI.

CLASS XX.

ANTHELMINTICS.

Anthelmintics may be defined to be agents which destroy or expel worms, or prevent their formation and development. They accomplish this in different ways:

1st. They may act as poisons to the worms, and this is the effect which many of the direct or specific vermifuges undoubtedly have. They may directly kill the worms, or so weaken or deaden them that they can not retain their position in the bowels, especially if the peristaltic action is increased by the action of a brisk cathartic. As examples of this class of anthelmintics, we may notice the spigelia marylandica, or pink-root, the chenopodium anthelminticum, artemesia santonica, aspidium felix mas, and, according to some authorities, the mucuna pruriens, or cowhage, and the pulvis stanni, or tin filings.

2d. Active and continued purgation may remove them, either by cleansing the stomach and bowels of the increased quantity of mucus and other matter upon which they subsist, and which forms their nidus; or by so debilitating them that they are rendered incapable of maintaining their position against the augmented peristaltic action of the intestinal canal, while under the influence of a powerful drastic cathartic.

3d. They may act directly upon the worms and disorganize or destroy them simply by their mechanical influence. Some of the anthelmintics of this class have been supposed to pierce the worms, and thus destroy them; the cowhage is an example of this kind. Drastic cathartics may also act as mechanical irritants, and destroy and remove them. They are also removed by the asperity of some of the metallic agents, as the ferri ramenta, tin filings, etc.

4th. Tonics may exert an indirect influence upon them that will tend to prevent their generation, and to their destruction and expulsion if they do exist. They doubtless act as prophylactics by invigorating the digestive organs, and removing that morbid condition which favors their generation. The deranged state of the digestive organs when the patient is infested with worms, would justify us in coming to the conclusion that a very morbid condition of the intestinal canal does exist when they are present. Their connection, says Dr. Joy, with a debilitated state of the constitution, and in many cases with a scrofulous habit, seems to be pretty well made out. The inactivity of the lacteal and absorbent vessels, and the consequent accumulation in the intestines of chyle and mucus, which form so congenial a food or so favorable a nidus for these animals, together with the generally weakened condition of the digestive organs in strumous patients, enable us in some degree to comprehend this cause; yet it is indubitable that they are also met with in the robust and healthy. Rush has even endeavored to make it appear that they are indicative of, or almost essential to the possession of perfect health; in which opinion, however, he has but few followers. It would seem that whatever produces a redundancy and stagnation of nutritive or animalized fluids in the intestinal tube—whether it be a too abundant supply of food, too active a chylification, or too great a secretion of mucus—is to be ranked among their causes. If, then, a morbid condition of the alimentary canal is a predisposing cause of worms, we should expect that such agents as would remove this condition would also cause the removal of worms, and prevent their regeneration. By the free use of tonics we accomplish these indications, we invigorate the digestive organs, and prevent the formation of this morbid accumulation, which is conducive to their generation, and upon which they subsist. Several very valuable tonics have been considered as among the best anthelmintics, as the chelone, tansy, quassia, gentian, iron, etc.

5th. Some of the alkaline and acid agents act as prophylactics, and not unfrequently remove or destroy worms. They probably act by dissolving the intestinal mucus, upon which the worm subsists, or by counteracting the production of the vitiated accumulations which favor their generation and growth.

There are some very effective anthelmintics, as the corsican, wormwood, male fern, etc., that exert no very visible influence upon the human system. It may be somewhat difficult to explain satisfactorily their modus operandi, but we suppose they must act as poisons to the worms. Though they produce no very perceptible effect upon man, yet that is no reason that they do not prove most virulent poisons to these *entozoa.*

"Of the medicines enumerated under the head of specific anthelmintics," says Dr. Joy, "several are of a highly dangerous nature, and, we repeat it, quite disproportioned to the importance of the malady; and some of the rest have a doubtful claim to the place which they occupy. Thus, it is very uncertain whether the salts of iron, as well as bitters and mineral acids, do not owe the whole of their beneficial influence, not to any direct or immediate impression on the worms, but to their gradual effect in improving the tone of the stomach and intestines. The employment of such measures as strengthen the body, constitutes by much the most important part of the treatment of worms, as it tends not only to prevent their formation, but also to remove the irritable state of the system so often present, and to add energy to the various functions, on the imperfect performance of which, much more than the presence of these animals, the troublesome symptoms depend. A diet consisting of food of easy digestion, and so restrained in quantity as to insure its perfect assimilation, along with a healthy habitation, a dry atmosphere, and regular exercise, will often, alone or with the aid of the mineral and vegetable tonics, prove perfectly sufficient to attain the desired end. If, however, they fail, and the evidence of the existence of worms and of their inducing irritation in the system, continues strong, the employment of some of the best established and safest of the anthelmintic medicines becomes justifiable. If a scrofulous diathesis, as is so often the case, co-exists, all those means which we know to be useful in its management, must be simultaneously brought into action. As to the nervous affections which form the great bulk of those fairly traceable to worms, we must endeavor to palliate them as they rise, by the use of a mild and demulcent diet, the tepid bath, and other antispasmodic remedies, until we can succeed in removing their cause by the means just alluded to."

DIVISION XII.

CLASS XXI.

SIALAGOGUES.

Sialagogues or masticatories act as topical excitants. They are pungent or acrimonious articles which when masticated cause a copious flow of mucus from the lining membrane of the mouth, and at the same time the orifices of the ducts of the salivary glands are excited, and this excitation is extended to the salivary glands whose secretory functions are greatly augmented and salivation is established.

They are local excitants and very limited in their curative influences upon the system. They act as revulsives and also as depletives. The new action which they set up in the salivary organs renders these glands the center of fluxion, and to them an increased determination of vascular and nervous excitement takes place—in this way they act as topical depletives and as revulsives. The copious secretion which they cause, greatly augments their derivative powers. In this way other organs in a state of undue excitement are relieved by withdrawing the excitement and concentrating it upon the salivary organs.

Therapeutic Application.—The more stimulating or pungent sialagogues are used as *masticatories* in toothache, headache, congestions of the brain, paralysis of the tongue or muscles of deglutition if the cause is local and not dependent upon some morbid state of the brain, facial neuralgia, aphonia, dysphonia, difficult deglutitition, etc., etc.

There are many vegetable agents that produce salivation. The iodine, iris, calamus, cochlearia, zanthoxylum, sanguinaria, mezereon, capsicum, piper, nicotina, etc., are occasionally used as sialagogues. Some agents that act as nauseants are also used as sialagogues.

CLASS XXII.

ERRHINES OR STERNUTATORIES.

THESE agents cause an increased secretion from the pituitary or schneiderian membrane and sneezing. The term sternutatory was formerly applied to those agents which produced sneezing—the two terms are now used as synonymous. The application of this class of agents is very limited. They are restricted to diseases of the head, and act as derivatives. They stimulate the pituitary membrane and cause an afflux to it, and an increased secretory action. By their topical excitant influence they render the pituitary mucous membrane the center of fluxion, and its mucous follicles are stimulated to an increased secretion. The same influence extends to the frontal, ethmoidal and sphenoidal sinuses, and also to the ductus ad nasum, by both a continuous and contiguous sympathy. In this way the secretion of tears is also greatly augmented, and there is consequently a derivation of the circulation from contiguous and adjoining parts. The copious secretion exerts its salutary influence not as a derivative alone but also as a *topical depletive*. Undoubtedly much of the advantage gained by the use of these agents in the diseases about to be named, is ascribable to this particular influence, though most authors attribute their sanative powers exclusively to their derivative influence. If the errhine be too strong, or if it remains in contact with the mucous membrane too long it arrests the secretion, yet its derivative powers are still manifest—showing that derivation is not the only way in which they prove beneficial; and proving most conclusively that the copious secretion, while it acts as a topical depletive, augments the derivative powers of the drug.

Therapeutic Application.—Their modus operandi at once suggests the cases in which they may be employed. By their excitation of the nasal mucous surfaces they produce a derivation of nervous and vascular action from adjacent and diseased organs. They frequently give relief in cases of cephalalgia by their revulsive influence and local excitant action upon the nasal organs. In catarrhal affections or in cases of obstruction in any of the nasal sinuses, sternutation is attended with advantage by removing the obstruction. In ophthalmia they are used occasionally with advantage. In disease of the ears, in rheumatic or paralytic affections of contiguous parts, they may be used with a prospect of benefiting the patient. They have also been used in toothache. In ulcers of various kinds, particularly in those of an indolent character they are indicated. Nasal polypi, concretions or tumors situated in the nose have frequently been removed by the use of those of a caustic character.

Those errhines that produce sternutation are *contra-indicated* in all cases where there is a predisposition to apoplexy, and whenever there is an undue determination to the brain. They are also contra-indicated in hemorrhages, aneurismal tumors, pregnancy, particularly if advanced and there is a predisposition to abortion, hernia, etc., for the very good reason that succussion attending the act of sneezing, acts violently and mechanically upon the organs implicated in the diseases referred to.

DIVISION XIII.

CLASS XXIII.

ANTACIDS.

Antacids are those agents which correct acidity, in whatever part of the system found, whether in the stomach, intestinal canal, blood or urine. Their action is essentially chemical, as they combine with acids in the system, forming neutral salts, the same as they would if brought together in the chemist's laboratory. They have, however, a secondary action; they not only neutralize the acid, checking its morbid action at the point where it is generated, but by removing this they may remove the cause of a disease at another and different part of the system. As an example of this, we might refer to the severe frontal headache, caused by acidity of the stomach, which is removed by the exhibition of antacids; while at the same time they remove the local irritation and pain of the stomach, caused by the presence of an excessive quantity of acid.

Antacids are principally employed to remove acidity of the stomach; and an important question in the consideration of their action and uses, is the condition of this viscus, that would give rise to an excessive generation of acid. In the normal condition of the stomach when it is empty, it has been shown by Dr. Beaumont, that the fluid which moistens its surface is slightly alkaline or neutral. The gastric juice, nature's solvent for aliment taken into the stomach, is acid; and this acid, whether it be *muriatic* or *lactic*, or both, is an essential constituent of it. But this acid leaves the stomach with the chyme, and is neutralized in the small intestine by the secretion of the pancreas, the liver and the intestine; the stomach being freed from acid when digestion is completed. "It is right, then," says Dr. Budd, "that while the stomach is empty of food, it should contain no free acid; and that the acid which is requisite for digestion, and which is secreted by the glands of the stomach on the contact of food should, after performing its office, pass into the duodenum, and in its course through the intestine, be either directly absorbed or be neutralized by the alkaline fluids with which it is then mixed. But in various derangements of the stomach the gastric acid is often secreted at unseasonable times, or in too great abundance; or other acids are formed in considerable quantity from the food, and the contents of the stomach are in consequence unduly acid."

A superabundance of acid in the stomach may be caused in three ways: 1. By secretion from the glands of the stomach; 2. It may be taken in the food; 3. It may be generated by decomposition or fermentation of the food in the stomach.

1. We have already seen that the stomach in its normal condition only secretes acid for the process of digestion, and that this acid is removed from the stomach with the chyme; none being left or secreted when the stomach is empty. What then will cause an untimely or excessive secretion of this acid? It has been found by experiment, that irritation of the stomach will cause an increased secretion of this acid at any time—Dr. Beaumont and Spallanzoni having collected it for their experiments by mechanical irritation of the mucous membrane. This, then, would account for its secretion, in irritation or chronic inflammation of the stomach (dyspepsia), simple ulceration, etc. A source of irritation in some other organ that can affect the stomach by a reflex nervous influence, according to Dr. Budd, will also cause an excess of secretion like direct irritation, as is often manifested in the gastric irritation during the passage of gall stones, in organic diseases of the brain, in tubercular disease of the lungs, and various other affections. The same author states, that "Excessive secretion of gastric acid may result from some fault, either inherited or acquired, in what have been termed the secondary assimilating processes, leading to

certain unhealthy conditions of the blood. This is seen most distinctly in gouty persons, and in men of middle age, who have led the life that disposes to gout. The excessive acidity of the stomach, to which such persons are prone, eems to result, for the most part, from an excessive secretion of gastric acid."

In each of these cases there may be an excess of acid in the system, and this is probably the case where it depends upon a fault in the secondary assimilating processes, resulting in an unhealthy condition of the blood. But where the excessive acidity of the stomach is caused by some irritation of that viscus, the acid of the system may be so monopolized that there is not sufficient to maintain the normal acidity of the urine, showing conclusively that it is deficient in the blood. In the first case, an alkali not only acts as an antacid, neutralizing the free acid in the stomach, and allaying the irritation produced by it; but, being absorbed into the blood, it acts as a restorative, lessening the abnormal acidity of this fluid. In the second case, although an alkali will neutralize the acid in the stomach, and thus give temporary relief, yet, as there is not a superabundance of acid in the system, it will eventually prove a positive injury, by rendering the blood and urine excessively alkaline.

2. In persons of feeble digestive powers, acids, as we have already noticed, are formed from the food by a process of fermentation. This does not occur when the stomach is in a healthy condition; the healthy gastric juice being in sufficient quantity for digestion, prevents fermentation, and the generation of acid. "But if the gastric juice be unhealthy, or be secreted too sparingly, or if, from obstruction of the pylorus or otherwise, the food be too long detained in the stomach, it often happens that digestion is disordered, and that there is set up in the stomach some fermentative process by which great quantities of acid are generated. This is especially the case, as Lehmann has asserted, in catarrhal states of the stomach, when, while the solvent juice is poured out sparingly, an unhealthy mucus is secreted, which rapidly decomposes and acts as a ferment for the food." Organic disease of the stomach may give rise to all these conditions, or they may arise from simple debility of

this viscus. The generation of acid from the fermentation of the food (which may generally be diagnosed when digestion is imperfectly and slowly performed), is not by any means a pathognomonic symptom of the condition of the stomach, and other symptoms will have to be considered in forming a diagnosis.

Other diseases frequently result from this fermentation and generation of acid in the stomach, such as colic, diarrhea, sick headache, etc. These are frequently relieved by the administration of antacids, as well as the *heartburn*, or pain in the stomach. Yet we must consider them only as palliative remedies, relieving the present disagreeable symptoms; while to effect a permanent cure, such remedies will have to be employed as give tone and strength to the digestive organs, thus removing the cause of the disease, or as we might more appropriately term it, *morbid symptom*.

"An excessive formation of lactic acid in the stomach," says Dr. Budd, "may lead to impurity of the blood in various ways. The derangement of digestion that attends the excessive formation of acid, may give rise to the formation of other hurtful matters in the stomach itself, and also during the subsequent passage of the vitiated products of digestion through the bowels; and these hurtful matters and part of the uncombined acid may be directly absorbed by the bloodvessels; or possibly, as Dr. Prout suggested, they may be absorbed by the lacteals, and cause additional impurity of the blood by preventing the proper completion of the chyle. Again, as I have just stated, excessive acidity of the stomach frequently causes or co-exists with defective action of the liver, kidneys and skin; and defective action of these important excreting organs may obviously lead to further contamination of the blood. Knowing, then, that an excessive formation of acid in the stomach may lead to impurity of the blood in so many ways, we can hardly wonder at the general or remote disorders which this condition sometimes induces."

In many diseases we have an evidence of an increased acidity of the blood, in the sour smell of the perspiration and the breath, the increased acidity of the urine, and the sour smelling and green alvine evacuations. In these cases antacids prove curative by neutralizing free acid, whether in the stomach or the blood.

In *fevers* we frequently meet with this condition, the acid character of the excretions being very apparent to the smell. This is particularly apt to be the case in the fevers of children. Here a prominent indication is the removal of the acidity, and the agents which accomplish this do more: by being absorbed into the blood, and excreted by the kidneys, they modify the character of the morbid matter in this fluid, and stimulate the urinary organs to eliminate it from the system. Alkalies, as has been stated (see *diuretics*), are among our most important agents in the treatment of fevers and inflammations.

Rheumatism, according to the present generally received opinion, is caused by an excess of acid in the system. Alkalies have been found to be among the most successful agents in the treatment of this disease.

They have been employed in *diabetes* as auxiliary agents, as it is said, with much benefit; the sour as well as saccharine smell in this disease would indicate their employment.

They are of much importance in the *lithic* or *uric acid* diathesis, as they counteract the generation of this acid, or if it does exist in the blood, it is neutralized there by the alkali.

CLASS XXIV.

ANTILITHICS.

ANTILITHICS are agents which counteract the predisposition to the formation of calculous concretions in the urinary organs.

The urine, when it is strictly healthy, instead of being a simple homogenous fluid, is one of the most heterogenous character. It is a chemico-vital fluid, holding various substances in definite proportions in a state of solution.

Changes in its composition are constantly occurring, or liable to occur. A redundancy or a deficiency in any of the healthy constituents of that fluid is to be regarded as a state of disease. If they are augmented beyond the standard of health, that fluid is not capable of holding them in a state of solution, and they are liable to be deposited, if not thrown off, in the form of a urinary sediment, which, by further accretion, may result in the formation of urinary calculi.

The general habit of body which tends to the formation of urinary sediments, is termed the *calculous diathesis.* No inquiries relative to the changes which are taking place in the system, can be more interesting to the pathologist than those which pertain to the investigation of the causes of the calculous diathesis, the modifications of health, the changes which take place in the urine, and the elements which it holds in solution in a state of health, and the depositions which often follow any transition from a healthy to an unhealthy state.

The most trivial disease of the genito-urinary organs often awakens the most lively apprehensions of the patient, and this is especially the case when calculi are supposed to be formed and to exist in the kidneys or bladder. The serious operation resorted to for its removal, together with all the suffering (which is by no means trifling), renders it a disease doubly alarming to the patient, as well as formidable to the physician.

Agreeably to chemistry, these urinary depositions vary as to composition in different individuals, or even in the same individual at different times, arising from modifications of health, diet, drinks, exercise, etc.

All the various urinary compounds, says Prout, are composed of the four following elementary substances: 1. The lithic acid and its compounds; 2. The oxalate of lime; 3. The cystic oxyd; 4. The earthy phosphates.

The same author remarks, relative to the forms in which urinary deposits occur, that though all are composed of the same ingredients, yet they may be "divided into three classes, viz.: 1. Pulverulent or amorphous sediments; 2. Crystalline sediments, usually denominated gravel; and, 3. Solid concretions, or calculi formed by the aggregation of these latter sediments."

The chemical history of the crystalline sediments or gravel and the solid concretions or calculi, can alone point to the true indications of cure.

The calculous diathesis in some cases seems to be hereditary, when it is extremely difficult to eradicate, and may be irremediable; diet and regimen, aided by suitable chemical antilithics and corroborants, may, however, accomplish much.

The two principal diatheses are the *lithic* or *uric acid diathesis* and the *phosphatic.*

Most of the *amorphous* and *pulverulent* sediments consist of lithic acid and its compounds. Agreeably to the data of Dr. Prout, two-thirds of the whole number of urinary calculi are connected with or arise from the predominance of this diathesis. The lithic deposit often forms the nucleus around which or to which other deposits become attached, and thus calculous concretions are formed.

"The yellowish, or nut brown, reddish brown or lateritious, or pink sediments," characterize the *lithic acid diathesis.*

The white or gray precipitates constitute the earthy phosphates and characterize the *phosphatic diathesis.*

"What the essential characters of these diatheses are," says Dr. Eberle, "it would be in vain to inquire."

It appears evident, however, that the *lithic acid* diathesis arises from the generation of acid as in *acid indigestion*. Whatever tends to enfeeble the digestive organs is particularly calculated to favor the production of this diathesis. "It appears, moreover," says Dr. Paris, "that whatever tends to disturb the process of digestion, by favoring the production of acid, may be considered as the exciting cause of lithic deposits, especially when the cutaneous functions are imperfectly performed." Those who use vegetable diet mostly, seem to be most frequently the subjects of this diathesis. Dr. Wilson Philip remarks, that acid and acescent ingesta tend to increase the deposition of lithic acid from the urine and to prevent that of the phosphates. The production of perspiration prevents the lithic deposit and promotes the phosphatic deposits. Dyspepsia favors the lithic while it lessens the phosphatic diathesis by producing acidity in the primæ viæ and rendering the skin less active. Indolence diminishes the activity of the digestive organs, and the activity of cutaneous transpiration, which favors the lithic acid diathesis by diminishing the amount of acid which should pass off through the cutaneous emunctories. It would seem that the lithic acid diathesis is intimately connected with the arthritic habit. It has been frequently remarked that the children of gouty parents have some of them been the subjects of gouty attacks, while others have been the subjects of calculous affections. This view is further corroborated by the concretions of the urate of soda met with in the joints of those who have been the subjects of repeated arthritic attacks: also from the derangements of the stomach and bowels.

From the foregoing remarks it is evident that there is a redundancy of acid generated in the system, arising in part at least from an enfeebled state of the digestive apparatus and from the fermentation and generation of acid which takes place from the use of large portions of indigestible vegetable food, the use of acids, etc., with a deficient action of the perspiratory vessels; for when they are active or when the insensible perspiration goes on freely, the lithic acid is carried off by the skin and its deposition in the urine ceases, or is diminished, the preponderance of acid in the circulation and urinary secretion is counteracted. This diathesis is indicated by the high color of the urine, and by the red, yellow, lateritious or pink-colored sediment deposited in the urine, resembling brick-dust; it being the crystals of lithic acid or lithate of ammonia. The urine in this case reddens litmus paper, showing that it is decidedly acid.

From what has been said relative to the exciting and proximate causes of this form of lithiasis, the treatment both medical and dietetic must be evident. If this variety of calculi be present, or if this diathesis exist, alkalies are of primary importance. They unite chemically with the acid in the primæ viæ and neutralize it; they are also absorbed and destroy the acid in the circulating fluids, and in the secretions, particularly the renal secretion, and thus prevent the deposition of the crystals of lithic acid, and if it exists in the urine, this being medicated, destroys it or prevents calculous concretions.

In connection with the foregoing agents, tonics to improve the functions of the stomach, mild diaphoretics to augment the insensible perspiration, and the alkaline bath will be found advantageous. Especial attention should be paid to the diet; mild, nutritious and digestible diet, with an increase of animal food, should be taken, not in excess, but in sufficient quantity to sustain the vigor of the system. All excesses should be carefully avoided. Moderate exercise, change of diet, air, exercise, scenery, society, etc., and every thing calculated to invigorate the physical and nervous powers will be calculated to counteract the tendency to the formation of lithic deposits.

By strengthening the digestive organs we render the chyle healthy, and prevent the undue formation in the chylopoiëtic organs of those materials, from which the urinary deposits are formed in the kidneys. The alkalies pass through the circulation, are separated by the kidneys, and "exert a solvent influence upon the lithic concretion, existing in the kidneys and bladder." The capacity of any agents now known to dissolve these concretions when fully formed into gravel or calculi, is, to say the least about it, problematical. They should be viewed as palliatives, or at best as preventives of this diathesis, and not as curative agents.

Phosphatic Diathesis.—This diathesis is exceedingly important in a therapeutic, as well as pathological point of view. The phosphoric acid and its numerous compounds in the form of urinary calculi, are truly formidable. "It is," says Paris, "to the abundance of its compounds that we are to look for mischief." In this form of lithiasis the color of the urine and the character of the deposits differ materially from those of the former habit. In this diathesis the urine is pale, and contains *white gravel* or precipitate of the earthy phosphates.

The crystals are pale brown, gray or white, and composed of the phosphoric acid, united with magnesia, ammonia or lime, mostly the latter; constituting the phosphates of magnesia, ammonia or lime respectively. In the formation of these calculous concretions, the alkaline principle preponderates.

In the phosphatic diathesis the symptoms are decidedly cachectic. The general habit is morbid or depraved—prostration of the whole system—debility and irritability of the nervous system in particular—lack of innervation—the nutritive and assimilating functions are impaired—in some cases the bladder loses its muscular power, arising from disease of the prostate gland, or injuries or diseases of the spine. Says Eberle, "The circumstances which appear to favor the formation of phosphatic diathesis are injuries done to the back, and whatever produces a nervous state of the system, as fear and mental anxiety, and also the long use of alkaline remedies."

Dr. Prout, after remarking that deposition of the earthy phosphates from the urine was attended by very distressing symptoms, says, "They consist in great irritability of the system, and derangement of the chylopoiëtic viscera in general, such as flatulence and nausea, obstinate costiveness, or peculiarly debilitating diarrhea, or both, frequently alternating; and the stools are extremely unnatural, being either black or clay-colored, or sometimes like yeast." He further observes there is pain, weakness and uneasiness in the back and loins, a sallow, haggard countenance, and symptoms analogous to those of diabetes.

This diathesis is most frequently met with during the middle or advanced periods of life, and after the process of ossification is completed.

"The urine of infants and nurses contain very little phosphate of lime and phosphoric acid; it is not until after ossification is finished that these elements are found in abundance in the urinary fluid. That of old men on the contrary, contains a great quantity of them; the bony system, already overcharged with the phosphate of lime, refuses to admit more of it. This saline substance would ossify every part, as it does sometimes in the arteries, ligaments, cartilages and membranes, if the urine were not to remove the greater part of this superabundant portion. In rachitis it is by the urine that the phosphate of lime passes off; the absence of which causes the softness of bones."

The medication in this form of lithiasis is very evident. The redundancy of the alkaline deposits or earthy phosphates, points unequivocally to the employment of acids, especially the mineral acids, as chemicals agents, to counteract this diathesis. In connection with acids, corroborants and alteratives to restore the tone of the general system, improve digestion, give energy to the nutritive and assimilating functions, and to give increased innervation, and thus counteract the deranged state of the chylopoiëtic viscera, and depraved or cachectic habit of body met with in this diathesis. The nitro-muriatic acid bath may be resorted to with a prospect of much advantage. The diet should be mostly vegetable, easily digestible, taken freely, but not in excess. Change of scenery, air, society, moderate exercise, regular habits,—in short, every measure calculated to improve and elevate the mental and nervous powers, as well as physical stamina,—are demanded.

It is proper in this place to remark that these diatheses not unfrequently alternate—the lithic may be converted spontaneously, or by the free and protracted use of alkaline medicines into the phosphatic; while the latter, by the use of certain dietetic measures, or by the use of acids, may be converted into the former. These changes are by no means unimportant, either in a pathological or therapeutic point of view. The conversion of one diathesis into another, as is often evinced by the change of urinary deposits from the use of medicine, has frequently caused the ignorant pretender to imagine that his agents were solvents of the stone or lithontriptics, and effecting cures by dissolving the calculi already supposed to be formed, and lodged in the kidneys or bladder; and as an evidence of the truth of his views he points exultingly to the deposits which have changed in character and greatly increased in quantity under the use of his medicine. This fact alone is often an evidence of his ignorance. He has given acids when alkalies should have been used, or used alkalies when acids would have been proper, or prescribed improper diet, and thus converted the deposits into those of an opposite character, and by the free use of his medicine has furnished the material of increased deposits. This increased lithic or phosphatic deposit, he supposes, is the calculi or stone which his medicine has crumbled to powder, and is now passing off freely, when in reality it is a change of the diathesis or an aggravation of the one already existing. The pathological character of the disease is now more intractible than before. The judicious physician will closely watch for these changes, and modify his treatment accordingly.

Though the principal forms of lithiasis are two—the *lithic* and *phosphatic*—yet the form, chemical character, gravity, etc., of the different forms of urinary calculi, resulting from their diathesis, are very variable.

1. LITHIC OR URIC SPECIES OF CALCULI.	Form, flattened and oval; specific gravity, 1.500; color, reddish brown; surface, smooth, with a laminated texture; chemical composition, lithic acid; mostly soluble in alkalies; common form of calculi—often constitutes the nuclei of other species.
2. MULBERRY CALCULUS.	Color, dark brown; texture, harder or more firm than other species; consists of the oxalate of lime—by heat is converted into quick-lime.
3. BONE EARTH. -	Color, gray or pale brown; surface smooth; structure laminated; composed mostly of the phosphate of lime.
4. TRIPLE. - - -	Color, brilliant white; surface uneven; less compact; is termed ammoniacs; magnesia phosphate; mixed with the phosphate of lime, pure alkalies decompose it by extricating its ammonia; attains a large size.
5. ALTERNATING. -	Exhibits different concentric laminæ; compound of different species.

Notwithstanding the general and very plain rules which have been laid down to guide the therapeutist in the administration of acids and alkalies as already indicated in the diathesis referred to, yet when they do exist until calculous concretions are formed, and when these concretions are laminated and of a compound character, the same measures may be resorted to to destroy the diatheses and prevent the further accretion to the nucleus already formed. In cases of the compound calculi, the use of acids and alkalies alternately will prove beneficial, or act as solvents—or as lithontriptics, some therapeutists suppose—by medicating the urine, which, if acid, will destroy the lamina composed of the earthy phosphates, and vice versa when the alkalies are used and the lithic concretes are exposed to the medicated alkaline fluid. "In the alternating calculi it may be judicious to exhibit these remedies alternately, as the symptoms of the case and the deposit of the urine may indicate." In this way these agents frequently corrode the calculi, render them rough and irritating to the urinary organs, which is often the cause of great irritation and suffering to the patient. In this way a disadvantage instead of an advantage, may result from these reputed chemical lithontriptics.

With regard to the causes which give rise to these diatheses, they are various and obscure. They seem, however, to be dependent upon some morbid condition of the stomach and chylopoiëtic organs. A dyspeptic state of the stomach seems to favor these habits, but particularly that of the lithic character. A morbid state of the digestive apparatus undoubtedly strongly predisposes to lithiasis. It is not improbable that the digestive organs form the materials, while the kidneys separate them from the blood. A morbid condition of the renal emunctories may separate that which in a healthy state would not be manifest. It is also very reasonable to suppose the urine, owing to some chemico-vital defect in its properties, is rendered incapable of holding in solution the phosphates and lithates, and hence they become deposited or precipitated in the form of powder, which forms the nucleus of the calculous concretions; these concretions grow by accretions of the respective depositions already named.

LITHONTRIPTICS.

Immediately and very intimately connected with the class of agents termed antilithics, are those called lithontriptics, or solvents of urinary calculi. That we are in possession of any known agents of this character, is highly questionable Some of the acid and alkaline antilithics, as stated unde that class of agents, will gradually destroy the stone, or cause it to dissolve or disintegrate by rendering the urine a chemical solvent. To accomplish this desirable object, recourse is had to the acids and alkalies respectively, to counteract the diathesis, giving rise to the particular calculous concretion, or cause a disintegration of that already existing. These measures, even when they do not cause a disintegration of the calculi, often greatly mitigate the sufferings of the patient. It is probable that these agents act mostly by counteracting those morbid conditions which give rise to calculous concretions, while the chemico-vital influences of the system cause its gradual solution. This view of the subject seems to be satisfactorily proved when the calculi is of the lithic acid character, by bringing the chemical solvents in direct contact with it, by injection, when it is found the bladder will tolerate the presence of an alkaline solution of sufficient solvent power to dissolve it. It would seem, however, from the experiments of Brodie, that the phosphatic and carbonaceous concretions, when imperfectly formed, may be dissolved by injecting a weak solution of nitric acid into the bladder. Unfortunately, says Paris, the irritable state of the bladder will not permit the retention of the proposed menstruum in contact with the calculi for a sufficient length of time to accomplish any material solution; and this mode of medication, at first view so plausible, and so full of promise, often proves unavailing, if not absolutely prejudicial.

Another and very ingenious mode of causing the disintegration of calculi in the bladder is suggested by M. M Prevost and Dumas. It consists in the application of galvanism, by passing a double sound into the bladder, and bringing one end in contact with the calculus, while the other is in contact with two vessels of water, connected together by the opposite poles of a galvanic apparatus. By passing a galvanic current through urinary calculi after being removed from the subject, or through them when placed in the bladder of a dog, the disintegration of the concretion has been effected. The proposition of these gentlemen has not been very favorably received. It is supposed that any decomposing power of this character, introduced into the bladder, might act with too much violence upon that viscus, and consequently would not be altogether devoid of danger. It must be admitted that the suggestion is highly plausible, and liberality forbids that it should be rejected without a fair trial.

After all our speculations upon the solvent power of different agents, it must be admitted that they often, and I may safely say, generally fail to accomplish the desired object; and in many cases, where the urgent symptoms disappear, and the lithontriptic is supposed to have effected a cure, the asperities of the concretion are removed, and it becomes enveloped in a coat of mucus, or imbedded in a cyst, which shields the bladder from its action, and thus obtains for the medicine the erroneous appellation of a true lithontriptic. We confidently look forward to the time, which we hope is not far in the future, when we shall be in possession of infallible agents for the relief of this much to be dreaded affliction.

With our present state of medical knowledge, the department of surgery affords the only certain *lithontriptic*, in the instrument called a lithontriptor, by which the calculus is crumbled to powder in the bladder, when it is readily passed off in voiding the urine.

DIVISION XIV.

CLASS XXV.

DEMULCENTS.

Demulcents are agents administered for the purpose of correcting the action of drastic or irritating medicines upon the mucous membranes, or to allay irritation or inflammation of those surfaces. When given to modify the action of an irritant upon a sensitive surface, they may be combined with it so as to involve the acid itself, or to so cover the mucous surface as to shield it from the effects of the remedy.

Demulcents do not prove valuable as medicines by changing the acrid or corrosive properties of the agents with which they are administered, but simply by involving them in a viscid fluid, or by shielding the parts with which they come in contact.

They are also valuable in cases in which the secretions poured into the primæ viæ become vitiated and irritating to the mucous membrane. They unite with it, dilute it, and thus destroy its irritant properties, besides shielding the mucous surfaces from its action.

Many writers upon therapeutics have very erroneously, as it seems to us, classed demulcents and emollients together, and regarded them as synonymous. It can not be denied that their properties are the same in most cases, but the difference between the two classes consists in their application or mode of employment. While the term *demulcent* is employed to denote internal agents,—those especially adapted to diseases of the mucous membrane,—the term *emollient* is applied to those external agents employed to soften and relax the tissues, allay irritation, inflammation and pain.

These agents, when taken into the stomach, soothe and allay irritation and inflammation, and are found to be very valuable in many diseases. They consist of the various mucilaginous articles, as the ulmus fulva, flax-seed, gum-arabic, etc., and some of the expressed oils, as the olive, almond, etc.

Their properties and mode of action very clearly point to their proper therapeutic employment. In all inflammatory affections of the respiratory apparatus, they are of unquestionable utility, their soothing influence upon the fauces, glottis and trachea, is extended to the entire mucous membrane of the air-passages, by contiguous and continuous sympathy, and the diseases materially modified by their employment. They are also employed in the form of emulsions, sirups, troches, etc., in cases of harrassing cough, with much advantage.

They are very important agents in the treatment of gastro-enteric inflammation. In gastritis, enteritis, diarrhea, etc., they come in direct contact with the parts inflamed, and allay the pain, irritation and exalted organic action, with more certainty than most of the classes of therapeutic agents. It is true, many of these agents, especially those of a mucilaginous character, are digested, which may diminish their beneficial influence to some extent; yet the intimate sympathy existing between every part of the mucous membrane, enables us to account for the sanative and very desirable remedial influence exerted by this class of agents. They may also prove valuable by mingling with the intestinal contents and rendering them less acrid and irritating.

They are, many of them, very nutritious, and very easily digested, and may be taken freely in febrile and inflammatory diseases, where there is extreme debility of the digestive organs, and where it is necessary that the patient should have unirritating and easily digested diet, and where the stronger articles would overpower the enfeebled organs and destroy life.

They are also valuable in calculous affections, and in cases of nephritis, cystitis, or urethritis; but it is difficult to comprehend how they influence the urino-genital mucous membrane, aside from their soothing action upon the other mucous surfaces, and their influence in allaying excitement in the general system. We believe a close sympathy exists between every part of the animal economy; but this is more especially the case between similar tissues and structures, of which the mucous membrane affords the best example.

Some have supposed that the various demulcent agents enter the circulation unchanged, and are carried to the urinary organs and pass off through them, and thus exert a direct influence upon the parts diseased. This supposition, however, has no foundation in fact; for the changes wrought upon all the mucilaginous demulcents by the digestive organs, as already stated, preclude the probability of their exerting a direct influence upon these organs, unless they act as diluents. The large quantities of aqueous fluid generally taken with them renders them diluents; and in this way, by increasing the fluid portions of the urine, they lessen its acrimonious character.

CLASS XXVI.

EMOLLIENTS.

EMOLLIENTS are a very important class of topical agents employed for the purpose of softening and relaxing the living animal fiber. These agents diminish the force of cohesion between the particles of matter to which they are applied, and render them more lax and flexible.

Dr. A. T. Thomson uses the terms emollient, demulcent and relaxant as synonymous. He defines them to be "substances which diminish the vital tension of the tissues, and lessen the acrimony by lubricating, softening and rendering more flexible the solid part of the body."

We have already stated, under the class of demulcents, that the terms when used as synonymous are misapplied and calculated to confuse the mind of the student. We shall, therefore, in this case employ the term emollient not in connection with that of demulcent, and not as synonymous. While the term demulcent is applied exclusively to the use of internal medicaments, that of emollient is applied exclusively to those of a topical and external character.

These agents, as stated by Dr. Thomson, diminish the vital tension of the tissues; they soften and relax the animal fiber, and render the solid parts of the body more flexible.

When oils, ointments, lard, etc., are applied to parts that are tense and resisting, they are insinuated between the particles; they lessen cohesion, soften and relax the tissues, and prove valuable therapeutic agents in numerous cases in which there is tension or rigidity of parts. This is especially the case when the perineum offers resistance to the advancing vertex of the child in parturition. The friction instituted in the application of warm emollient agents, as oils, lard, etc., or sitting over the vapor of bitter herbs, exerts a very salutary influence in softening and relaxing the parts, and thus overcoming, in a conspicuous manner, the strong resistance presented to the advancement of the labor. They are very important local applications in bruises, injuries, sprains, abrasions, contusions, boils, ophthalmia, painful tumors, painful and irritable ulcers, superficial or deep-seated congestions or inflammations. They soften and relax the tense condition of the parts, soothe and allay inflammation, and are of great utility in relieving pain and promoting resolution. By softening and relaxing the tissues, they act as discutients. Those into which some of the narcotic agents enter, are found to be the most effectual as discutients, and should be employed in cancerous ulcerations of a painful character, in scirrhus or cancerous tumors, scrofulous and syphilitic tumors, etc., to bring about resolution.

In all local, circumscribed inflammatory affections this class of agents is found to be of the greatest utility in effecting a dispersion of the local exalted organic excitement, and thus preventing suppuration, if resorted to in the early stages of the complaint. If, however, the period has elapsed during which they can prove beneficial as resolvents, they will still be found valuable in softening and relaxing the parts, diminishing the vital tension and cohesive attractions of the tissues involved in the *phlegmasia*, and in promoting suppuration and an early discharge of the purulent secretion. Hence their utility in boils, tumors, etc., of every kind.

If the emollient is of an unctuous character, and is applied by friction, it insinuates itself between the solid particles or into the solid fiber, and thus diminishes the density and probably lessens the friction between the molecules of matter involved in the suppurative process; but warm cataplasms and warm fomentations prove advantageous by their soothing, softening and relaxing influence, as has been before stated.

Bland and mucilaginous lotions applied to the eye in ophthalmia, or to the surface in cases of blisters, excoriations, erysipelatous affections, etc., exert their salutary influence in the same way.

Warm *cataplasms*, *fomentations*, *cloths*, vapor of warm *water*, *vinegar*, spirits, etc., when applied to the surface at a temperature a few degrees below the ordinary warmth of the body, proves emollient; but when applied at a temperature a few degrees above that (say 120°), it then acts as a *rubefacient* and is really a very potent revellent.

We often apply hot *cloths*, hot *fomentations*, heated *vapor*, etc., to the human system, with a view to secure their stimulant or *revulsive* and *emollient* effects, for if applied to the surface at a temperature of from 110 to 130, it speedily produces rubefaction of the part with which it is brought in contact, and hence its utility in deep-seated inflammation, as in peritonitis, the various forms of pneumonia, rheumatism, etc.; but as the temperature subsides the revulsive influence is lost, when it soothes and acts as a sedative, it then becomes *emollient*; then "the relaxing effects of warmth and moisture upon the extreme vessels of the surface (says Paris) is propagated by contiguous sympathy to the deeper seated organs." Thus it will be seen the agents applied at different degrees of temperature may prove *revulsive* and *emollient*. As revulsives, we can see how deep-seated congestions or inflammations may be relieved by an extensive application of these agents. The application should be large and rapidly reapplied if the case be urgent, in order to secure the full advantages which this class of medicinal agents are capable of affording. If applied at a lower temperature it relaxes the parts to which it is applied, and that influence is extended to deep-seated parts by a sympathetic action, and the engorged vessels or tissues inflamed are relieved—a similar influence is extended to every part of the cutaneous capillaries. They tend to relax the cutaneous constrictions if extensively applied, and promote perspiration; the same remarks apply to the relief of pulmonary constriction, spasms of various kinds, convulsions, etc. In short they are important topical applications in all acute inflammatory affections.

Their influence upon the general system is often very clearly manifested in subduing the local irritation and preventing the general system from participating or sympathizing in the local affection: general irritation or fever is often prevented, the amount of disease greatly lessened, and in many cases spasms or tetanic convulsions prevented, by the soothing influences of anodyne and emollient applications.

CLASS XXVII.

DILUENTS OR ATTENUANTS.

DILUENTS or attenuants are imperiously demanded by the laws of animal instinct, to lessen the inspissated and viscid character of the blood, both in a state of health and disease. They allay thirst and render acrid secretions less irritating and more abundant, by furnishing the necessary supply of materials for secretion, and in this way they lessen irritation, inflammation and fever.

When we take into consideration the incessant drain of fluids by the great emunctories of the system, as the urinary and intestinal secretions, the cutaneous and pulmonary transpirations, and the preponderance which the liquids entering into the composition of the animal economy bear to the solids, it is not strange that the demand for liquids should be more imperious than it is for solids. The sensation of thirst is often dependent upon the inspissation of the blood, and as soon as it is diluted by injecting fluids into the veins, it is allayed. If taken into the stomach or injected into the bowels, it is absorbed, and dilutes the blood and allays thirst. Thirst is also a very prominent evidence of disease, especially those of a febrile and inflammatory character. In such cases their utility is not exclusively dependent upon their attenuating properties. The demand for drinks does not always arise from inspissation of the circulating fluids. Hence they can not be properly called diluents (when this is not the case). The highly exalted organic action which arises in the mucous membranes of the alimentary canal, occasions the thirst in these cases, and the well-known influence of liquids, and *particularly cold water* and *acidulated drinks*, etc., in diminishing this excitement and allaying the thirst, explains their therapeutic application in such cases. Cold drinks act as refrigerants. Warm drinks do not. Cold drinks lessen the organic actions in the intestinal mucous membranes, and warm ones are comparatively inert; hence the demand for cold drinks in febrile excitement. In many cases of fever the sensation of thirst is very imperious, arising from the united causes just referred to, that is, from the diminution of the serous fluid in the blood, and also from the morbid erythism existing in the mucous membranes. So long as this erythism, or exalted organic action in these membranes exists, imbibition or venous absorption goes on slowly, and hence the difficulty of allaying thirst. From what has been said, it will readily be seen why it is we have such intense thirst in Asiatic cholera, cholera morbus, and even after the action of a powerful hydragogue cathartic, and the reason why it is so difficult to allay that thirst. If no such exaltation of organic action existed, the reduction of the serous fluid would facilitate absorption, and the urgent thirst would be speedily allayed.

In febrile and inflammatory states of the system, particularly in inflammation of the mucous membranes, the secretions become acrid, and act as local irritants or excitants, and often exert an agency in maintaining the febrile and inflammatory excitement; such is the case in gastritis and enteritis. In bronchitis the saline secretion excites the mucous membrane and induces coughing to expel it. In such cases warm diluent drinks, cold water, demulcent drinks, etc., lessen the acrimony of the secretion by diluting it, or they may involve it and shield the abraded and morbidly sensitive mucous surfaces from the action of the acrid secretions and accumulations. It is true they do not act directly upon the mucous surface of the lungs in pulmonic affections, but their influence upon the mucous surfaces is extended to the lungs by continuous sympathy; and hence the importance of mucilaginous diluents in those affections.

In diseases of the urinary organs, particularly in inflammation of those organs, as in nephritis, cystitis, or urethritis, the free use of demulcent or mucilaginous infusions is of unquestionable utility. They serve to weaken the saline compound—the urine—and lessen its stimulating properties, and, in part, to prevent the irritation which it would produce upon the inflamed parts.

They may either facilitate or retard digestion, depending upon the quantity of liquids taken. If the salivary and other secretions are scanty, and not sufficient to exert upon the alimentary mass the due solvent influence preparatory to the gastric action upon it, they are found to promote the process of chymification; on the contrary, if no such aid is required, the free use of diluents, a short time before, during or immediately after meals, will retard the process of chymification by too much diluting the gastric secretions, and by rendering the alimentary mass too soft and pulpy for the stomach to exert its necessary influence upon.

In cases where acrid and poisonous agents are taken into the stomach, diluents are required to weaken the deleterious poison and prevent it from acting violently upon the stomach. In the same cases they favor the action of emetics, and should be used freely to cooperate with them in the production of emesis.

In the treatment of dropsy, the ordinary use of diluents is objectionable. The exhalation or dropsical effusion is derived from the blood, and as a corresponding diminution in the quantity of that fluid must follow, and as absorption is slow in proportion to the existing vascular fulness or repletion, and active in proportion to the reduction of it, it is evident the free use of diluents, by furnishing the materials for absorption, would retard the removal of the dropsical effusion, and is, therefore, objectionable. However, the same objection would not rest against the use of active diuretic infusions, as a solution of the bitartrate of potassa, juniper berries, horse-radish, etc.; for though they would supply materials for absorption, yet the advantages gained by the increased flow of urine would preponderate and render them valuable therapeutic agents.

They are also important as diaphoretics. The free use of warm diluent drinks removes the constriction of the cutaneous emunctories and promotes perspiration; and hence their great importance as diaphoretics, diuretics, etc., in the treatment of febrile and inflammatory diseases. Even cold water, acidulated and refrigerant drinks frequently act as diaphoretics and diuretics, as well as diluents. When there is vascular excitement, with a hot, dry, and constricted state of the dermoid tissue, there is a corresponding exaltation of organic action on the mucous membranes, and in the internal organs generally. In such cases the sedative influence of cold fluids lessens the internal orgasm, and by continuous sympathy abates the external heat, the capillary excitement, and removes the cutaneous spasm, and proves diaphoretic, diluent, and febrifuge.

Another cogent argument in favor of the employment of simple diluents or *unmedicated medicaments* in febrile and inflammatory excitement, is the continued waste which the system has to sustain in the various secretions and transpirations. They diminish the aqueous portion of the blood rapidly, and when this reduction is not compensated by the ingestion and absorption of more, the residue of the blood loses its requisite fluidity; hence it does not flow so freely through the capillary system; not only so, it becomes too exciting, too stimulating to the heart and arteries, and causes congestions and inflammations, and often aids in maintaining the excited organic actions until the continued excitement exhausts the recuperative energies of the system and the patient. The superiority of that system of practice which tolerates the use of no medicines that will not admit of the free use of cold drinks in the treatment of febrile and inflammatory diseases, is a desideratum of infinite importance to the sick, as well as a source of great comfort to the parched and famishing patient. These sanitary influences are of immense importance in the treatment of many diseases. They subdue augmented arterial excitement, restore the secretions and maintain their healthful qualities, and thus prevent them from becoming vitiated and irritating. They calm and allay nervous excitement, and though simple, are none the less important as curative means.

DIVISION XV.

CLASS XXVIII.

ANTIDOTES.

Antidotes are defined to be those agents which are capable of counteracting the injurious effects of poisons. They may properly be divided into two classes, *direct* and *indirect*, according to their action: thus, an agent which, when administered, will chemically combine with a poison and render it insoluble or inert, would be called a direct antidote; while one that would evacuate it from the system, or shield the mucous membrane from its action, would be termed indirect.

In the treatment of cases of poisoning, Pereira mentions five indications to be fulfilled:

"1. The most important is the removal of the poison from the part to which it has been applied. From the *stomach* it is removed by the stomach-pump, by the use of emetics, by tickling the throat with the finger or a feather dipped in oil; and, in the case of irritant poisons, by promoting vomiting by diluents and demulcents. In corrosive poisoning (as by strong acids and alkalies), the use of the stomach-pump is dangerous. As house or domestic emetics, a dessert-spoonful of flour of mustard, or a tablespoonful of common salt, stirred up in a tumblerful of water, or strong soapsuds, may be used. But the more effective emetics are one or two scruples of sulphate of zinc, or five to fifteen grains of sulphate of copper. The emetic should be given in a glass of warm water, and repeated in a quarter of an hour if it has not operated. From the *bowels* the poison is best removed by the use of castor-oil and laxative enemata.

"2. Another indication in the treatment of poisoning is the use of chemical neutralizers, called *chemical antidotes.* These either render the poison insoluble, and thereby prevent its absorption, or convert it into a harmless soluble substance.

"3. A third indication is to sheathe the living part from contact with the poison, by which not only the topical irritant action, but also the absorption of the poison is prevented or lessened. These may be termed *mechanical antidotes.* Thus in poisoning by acrid or caustic substances, considerable relief is attained from the use of diluents, demulcent and mucilaginous liquids, oils, and fine impalpable powders. They lessen the irritant effect of the poison by enveloping it; and by sheathing the stomach and bowels, they also retard absorption.

"4. A fourth indication is to counteract or relieve the effects of the poison. This is effected by agents which may conveniently be termed *dynamical antidotes.* Thus coffee is given to counteract the narcotism produced by opium; ammonia to relieve the depression caused by foxglove or prussic-acid; opium to allay the acute pain produced by irritant poisons, etc.

"5. A fifth indication is to promote a speedy removal of the poison from the system after its absorption. Most poisons are absorbed into the blood, and are subsequently expelled from the system by the excreting organs; but it is very doubtful whether we have any means of accelerating their elimination."

Poisons have been very judiciously classed by most toxicologists under the three following heads: *Irritants, Narcotics,* and *Acro-Narcotics* or *Narcotico-Acrids.* These very significant terms convey to the mind the different effects and symptoms which may be expected to arise when the articles of either class are taken in poisonous doses.

The first class — irritants — embraces the vegetable acrids and corrosive minerals. These agents produce *gastro-intestinal inflammation,* and if still more freely taken, a destruction of the mucous membrane. Among the vegetable acrids we might name a large number, including most of the emetics and drastic cathartics, as the squill, euphorbia, etc., among the former, and the scammony, elaterium, gamboge, etc., from the latter. As examples of the corrosive mineral agents, we might name the different preparations of arsenic, antimony, mercury, copper, zinc, silver, gold, etc.

The second class embraces all those *narcotics* which are not possessed of acrid properties; as the opium, morphia and its salts, conium, stramonium, belladonna, hyoscyamus, etc. They act feebly on the part to which they are applied, but powerfully upon the brain and nervous system.

The third class presents us with a list of agents which partake somewhat of the nature and properties of both the former. The *acro-narcotics* are very apt to produce gastro-enteric inflammation if incautiously used, and many of them if taken in large quantities, act very powerfully on the brain and nervous system. Many very deadly poisons, as well as valuable medicinal agents belong to this class. As examples we may enumerate the aconite, veratrum album and viride, hellebore, tobacco, lobelia, arnica, etc., all of which frequently exhibit the evidences of their irritant and narcotic powers, even when administered in medicinal doses.

In the treatment of all cases of poisoning, no matter what agent has been used, certain general indications have to be fulfilled. Thus a first and prominent indication is to remove the poison from the stomach as speedily as possible. This may be accomplished with the stomach-pump, by the use of emetics, or mechanical irritation of the fauces to produce vomiting. If the poison is readily soluble, dry vomiting is preferable for the reason that when the poison is dissolved in a large quantity of fluid, it is absorbed with more facility, than when no diluents are administered. If, however, the stomach-pump is at hand, free dilution is not objectionable, providing the pump is immediately used. These remarks apply more especially to the narcotic poisons. If the poison is a vegetable acrid or corrosive mineral, the use of diluents, mucilaginous or demulcent liquids, oil, etc., are indicated to shield the stomach against their corrosive influence, and to some extent prevent absorption.

If there is a chemical antidote to the poison employed,—one that will either change it into an insoluble or inert compound,—this should be employed from the first, and continued until all symptoms of poisoning are removed. If the poison has been absorbed and produced its general effects upon the system, these will have to be counteracted as a general rule, by agents which have an opposite effect. Sometimes it is necessary to employ these three means at the same time; while we may attempt to remove any free poison from the stomach by evacuating that viscus, we administer the chemical antidote, and counteract its general influence by other measures.

Agents which promote absorption should be invariably avoided, when the poison taken is liable to be absorbed and produce general effects.

The effects of local poisoning, as the bite of a rabid animal, the rattlesnake, viper, copperhead, etc., and wounds made in dissection, or with an instrument impregnated with putrefactive animal matter, are best counteracted by the immediate excision of the part, or by scarifying and cupping. In this way we effect the removal of the blood impregnated with the poison, as well as the poison itself. Ligatures applied to a limb above the part bitten or wounded, act upon the same principle. Caustics are also occasionally applied to the seat of the injury and the part converted into an eschar, suppuration is established, and the poison if not destroyed is drained from the injured parts. If the ligature, cups or caustic be relied on, the earlier the application the greater will be the prospect of success. The influence of these animal poisons is always depressing, and hence it is of the greatest importance that tonics and stimulants should be freely employed to counteract this. Free use should also be made of those agents which when taken internally counteract the septic tendency in the blood.

The physician is not always called upon to treat the early effects of poisons, and even if he were, secondary phenomena would generally arise demanding his attention. These secondary symptoms or poison-induced diseases, are to be treated on general principles, without any especial regard to the cause which produced them.

The following table of poisons, their symptoms and treatment, has been compiled from the best sources:

IRRITANT POISONS.

Poisons.	Symptoms.	Treatment.
ACIDS. *Sulphuric.* *Nitric.* *Muriatic.* *Nitro-Muriatic.* *Oxalic.* *Acetic.* *Citric.* *Tartaric.* REMARKS.—The animal and vegetable acids (with the exception of the oxalic) are rarely used as poisons. The oxalic acid, from its resemblance to epsom salts, has been frequently taken by mistake; and, from the ease with which it is procured, has frequently been employed as an instrument of murder.	When a poison of this class is internally administered, the consequences which it produces are either the immediate and complete destruction of the parts with which it comes in contact (an effect determined by the more powerful escharotics alone), or such a degree of irritation as leads to inflammation of some part of the intestinal tract, succeeded by its usual consequences—increased vascularity, effusion of coagulable lymph, and occasionally of blood, ulceration, softening, and sometimes thickening of the villous coat, and lastly, gangrene or slough. These effects are observable in the mouth and fauces, in the œsophagus, stomach, small and great intestines; but they do not invariably occur in all these places, nor in all with the same degree of intensity. Such being the pathological condition of the intestinal tube, the accompanying symptoms may be easily conceived. The epigastrium becomes the seat of a burning pain, and shortly after vomiting ensues, by which the contents of the stomach are first rejected, and subsequently a viscid mucus, streaked with, and often containing coagula of blood. The epigastrium is obviously swollen, tense and tender, and the distress in this region is greatly augmented by pressure. The inflammation is sometimes confined to the stomach, but more usually it extends to the lower intestines, producing general abdominal pain and tenderness upon pressure, purging accompanied by tenesmus and bloody dejections. When the deleterious substance belongs to the class of escharotics, and is either very soluble in water, or has been administered dissolved in some chemical menstruum, the mouth, tongue and throat are the parts which first suffer from its action, and to which the earliest symptoms are referred. These are burning pain and a sense of constriction in the fauces, prevent-	In poisoning with the acids, *alkalines* and the *fixea oils* are antidotes. For the mineral acids we may administer magnesia, chalk (or whiting), with milk, soapsuds, dilute solution of carbonate of soda or potassa, or almond, olive or lamp oil. With the exception of the nitric and oxalic acids, these agents may be used as antidotes indiscriminately; but in poisoning with the two acids named, the carbonates of lime and magnesia alone can be employed with safety; and for the oxalic acid the first of these is decidedly preferable, as the resulting compound, oxalate of lime, is inert. In poisoning by sulphuric acid, water should not be drank, on account of the heat generated by their mixture. The subsequent inflammation should be treated on general principles.
ALKALIES AND THEIR SALTS. *Ammonia.* Strong liquor or hartshorn. Muriate of ammonia or salammoniac. *Potassa.* Caustic potassa or liquor potassæ. Carbonate of potassa or pearlash. Nitrate of potassa. Sulphuret of potassium. *Soda.*		The vegetable acids, as vinegar, lemon juice, citric and tartaric acids, are antidotes to the action of alkalies; as, also, are the fixed oils, they forming soaps with them, thus destroying their corrosive properties. In poisoning by nitrate of potassa, mucilaginous drinks should be freely administered, and the resulting inflammation treated on general principles. It is said that common salt, or the liquid chloride of soda, will decompose and neutralize the sulphuret of potassium.

IRRITANT POISONS—CONTINUED.

Poisons.	Symptoms.	Treatment.
EARTHS AND COMPOUNDS. *Baryta.* Carbonate of baryta. Chloride of barium. Nitrate of baryta *Lime.*	ing or materially impeding the act of deglutition, and the entrance of air into the lungs. In addition to these local symptoms, it may be also observed that the constitution will be always found to have undergone serious disturbance. The pulse will be rapid and feeble; the countenance will be flushed, or exhibit a deadly paleness; there will be excessive prostration, and the entire body will be covered with a cold and clammy sweat.—(*Apjohn.*)	In cases of poisoning by muriate of baryta, a solution of soda or magnesia administered will prove an antidote. This should be done without loss of time, for the poison acts rapidly. By this means the barytes is converted into the insoluble sulphate, which is inert. If the carbonate should have been the preparation used, the soluble sulphates should be replaced by copious draughts of dilute sulphuric acid. The antidotes for lime are the same as for the caustic alkalies.
METALS. (*a.*) **ANTIMONY.** *Tartar Emetic.* *Chloride* or *Butter of Antimony.* *Oxyd of Antimony.*	(*a.*) In poisoning by the preparations of antimony, the agent is generally rejected by vomiting; in fatal cases the vomiting becomes obstinate, there is burning pain in the stomach, purging accompanied with violent colicky spasms, constriction of the throat, distressing cramps of the limbs, delirium and convulsions.	In cases of poisoning by any of the preparations of antimony, if vomiting has not occurred, it should be excited by tickling the fauces with the finger or a feather dipped in oil, and by tepid bland liquids. The antidote is tannic acid, and vegetable substances containing it, as tea, galls, white-oak bark, Peruvian bark, etc., which should be immediately and freely administered in solution or infusion.
(*b.*) **ARSENIC.** *Arsenious Acid* or *White Arsenic.* *Yellow Sulphuret of Arsenic.* *King's Yellow.* *Red Sulphuret of Arsenic.* *Fowler's Solution.* *Arsenical Paste.* *Arsenical Soap.* *Arsenite of Copper.*	(*b.*) Nausea and faintness are the first symptoms, to which succeed a burning pain in the stomach; obstinate vomiting, which, if it does cease for a moment, is immediately excited by any kind of drink; a sensation of dryness, heat and tightness in the throat; diarrhea, accompanied with tenesmus; abdomen tense and painful; pulse small, quick and feeble; the surface cold and clammy; the urinary organs affected with violent burning pain and suppression; delirium, convulsions and death.	In cases of poisoning with any of the preparations of arsenic, the first indication is to remove from the stomach any of the free poison. For this purpose, an active emetic of ipecacuanha and mustard should be administered, and the stomach thoroughly evacuated. The *hydrated sesqui-oxyd of iron* should then be freely administered as an antidote to the poison. If it has been obtained before the emetic was given, it should not be delayed for its action, but administered immediately. When the poisoning has been occasioned by *arsenite of potassa* (Fowler's solution), soda, or ammonia, or by the salts of arsenious acid,

IRRITANT POISONS—CONTINUED.

Poisons.	Symptoms.	Treatment.
Children have been poisoned, it is stated, by chewing visiting cards; arsenic having been used in the enamel.		after giving the first dose, vinegar should be added to the antidote, to neutralise its acidity. The general symptoms will have to be treated upon general principles.
BISMUTH. *Nitrate of Bismuth.* *Pearl Powder.* *Oxyd of Bismuth.*		Evacuation of the poison by the stomach-pump or emetics is the first indication — milk and mucilaginous drinks are recommended to shield the stomach. The inflammatory symptoms are to be treated on general principles.
(*c.*) COPPER. *Sulphate of Copper* or *Blue Vitriol.* *Acetate of Copper* or *Verdigris.* *Carbonate of Copper.* Food cooked in dirty copper vessels, or pickles colored green by copper.	(*c.*) The symptoms of poisoning by copper are headache, cutting pains of the bowels, vomiting and purging, coppery taste in the mouth, and strong aversion to its taste, cramps in the legs, and pains in the thighs, jaundice, etc. The pulse, almost from the commencement, is small, quick and feeble.	No time should be lost, and none of the ordinary means omitted for expelling the poison from the stomach. Albumen administered in any of its forms, as white of egg, milk, etc., retards the action of the poison. The subsequent treatment should be the same as for other irritant poisons.
GOLD. *Chloride of Gold.* *Fulminating Gold.* *Purple of Cassius.* *Iodide of Gold.* *Cyanide of Gold.* *Chloride of Gold and Sodium.*		In poisoning by any of the different preparations of gold, the same treatment should be pursued as in poisoning by the bichloride of mercury. The salts of gold are said to be decomposed by sulphate of iron, and this has been recommended as an antidote.

IRRITANT POISONS—CONTINUED.

Poisons.	Symptoms.	Treatment.
(*d.*) **LEAD.** *Acetate of Lead* *Sugar of Lead.* *Carbonate of Lead.* *Red Lead.* *White Lead.* Water, food or liquors impregnated with lead, frequently produce the symptoms of lead poisoning; as, also, do the different occupations where lead is freely employed.	(*d.*) When a soluble salt of lead is taken or administered for the purpose of poisoning, the morbid phenomena that ensue are similar to those produced by other irritant poisons. But if some of the insoluble, or even small doses of the soluble preparations, is taken, or if the poison is taken with the food, water, etc., or is introduced into the system from the occupation of the patient, the results are very different. From the commencement, there are either none, or but very slight symptoms of irritation of the alimentary canal. A lead colic is after some time developed. This sometimes begins suddenly; more frequently it is preceded by gastric derangement, such as nausea and vomiting; cramps of the stomach next set in, and these gradually extend over the abdomen, and at length degenerate into a colic, scarcely to be distinguished from the ordinary form. The abdomen is usually tense, the navel drawn in; the pain is intermitting, and is relieved by pressure; the bowels are generally costive, though sometimes there is diarrhea; the urine is scanty; the saliva copiously secreted, and of a bluish color; there are dull aching pains in the limbs; the skin exhibits a dull, cadaverous aspect, and is bathed in a cold, clammy sweat; the countenance is gloomy and desponding, and the pulse, though sometimes accelerated, is generally slower than usual.	In cases of poisoning by any of the salts of lead, the first indication is to remove it from the stomach. For this purpose the sulphate of zinc is probably the best agent, as it not only produces free emesis, but also acts as an antidote. The salts of lead are converted into insoluble compounds by the administration of the sulphates of soda or magnesia in solution. The "*white liquid physic*" is also a very useful antidote. In chronic lead poisoning, attended with lead colic, the bowels should be kept regular with the cathartic last named: tonics and stimulants should be employed to increase the strength, and above all the patient should be removed from the cause of the disease.
SILVER. *Nitrate of Silver.*		Common salt immediately decomposes the nitrate of silver, destroying its activity. The inflammation should be treated on general principles.
(*e.*) **MERCURY.** *Bichloride of Mercury* or *Corrosive Sublimate.* *Cyanide of Mercury.* *Iodide of Mercury.* *Nitrate of Mercury.* *White Precipitate.* *Red Oxyd* or *Red Precipitate.* *Sulphate* or *Turpeth Mineral.* *Vermillion* or *Red Sulphuret.* *Calomel.*	(*e.*) Violent symptoms of irritant poisoning; harsh, metallic astringent taste; burning pain in the stomach; vomiting and purging frequently of bloody matter; often irritation of the urinary organs, and sometimes suppression; tightness and burning in the throat, occasionally so great as to prevent speech; countenance not always pale, but sometimes flushed; tendency to doze; stupor, convulsions and death.—(*Dunglison.*)	In cases of poisoning by mercury, albuminous substances, as white of egg, milk, a mixture of wheat flour, etc., should be immediately and freely administered. This does not prevent, but only retards the absorption of the poison, and consequently its constitutional effects will be liable to be produced. The inflammation, salivation, etc., will have to be treated on general principles.

IRRITANT POISONS—CONTINUED.

Poisons.	Symptoms.	Treatment.
(*f.*) ORGANIC IRRITANT POISONS. *Convolvulus Jalapa.* Jalap. *Convolvulus Scammonia.* Scammony. *Croton Tiglium.* Purging croton. *Cucumis Colocynthis* Colocynth. *Euphorbia Officinarum.* Euphorbium. Spurge. *Momordica elaterium.* Squirting cucumber. Etc., etc., etc.	(*f.*) The vegetable acrids, when swallowed in large doses, very generally give rise to vomiting, by means of which the poison is discharged. Sometimes, however, they are retained by the stomach, particularly when the quantity has been small; and in these cases diarrhea usually sets in, attended by abdominal pain, which is at first remittent, but becomes more constant in proportion to the development of inflammation in the intestinal tube. The belly now becomes tense and tender. The debility is great, and giddiness and tendency to delirium, are sometimes, though rarely, observed.	In the treatment of cases of poisoning by the vegetable irritants, the practitioner will have to be governed by general principles, as there is no chemical antidote to them known. The first indication in every case is to remove the poison from the system as soon as possible; thus, if emesis has not already been produced, an emetic, or the use of the stomach-pump, is necessary. If vomiting has been produced, it may be rendered much easier by the free use of diluents, and the stomach and bowels may be shielded from the action of the irritant by demulcents. If it should be desirable to produce catharsis, an unirritating agent, as the castor oil, would prove most useful.

ACRO-NARCOTICS.

Poisons.	Symptoms.	Treatment.
SOLANEÆ. *Atropa Belladonna.* Deadly nightshade. *Datura Stramonium.* Thorn apple. *Nicotiana Tabacum.* Tobacco.	The symptoms of poisoning by belladonna and stramonium are: dryness of the throat and fauces; dilation of the pupil and insensibility to light; delirium, usually of a very extravagant description; stupor, coma and death. Convulsions of a violent nature are rare, though, occasionally, muscular twitchings and subsultus tendinum have preceded death. The symptoms produced by tobacco are, in the first instance, slight excitement, followed by giddiness, syncope, nausea and vomiting, feeble pulse, a state of stupor or lethargy, insensible pupil, laborious breathing and convulsive twitches of the muscles generally.	In cases of poisoning with belladonna or stramonium, the first indication is to remove the poison from the stomach as soon as possible, with the stomach-pump, or an emetic. As an emetic, from half to a tablespoonful of mustard in a glass of water will probably be found the best. After the stomach has been evacuated we may derive benefit from the use of a decoction of green tea or nut-galls. The depression, and other symptoms produced, must be treated on general principles. In poisoning with tobacco, the same treatment, with the employment of the vegetable acids and coffee, or if the depression of the vascular system be extreme, the use of the stronger stimulants, as ammonia, brandy, etc., and the cold douche should be resorted to.

ACRO-NARCOTICS—CONTINUED.

Poisons.	Symptoms.	Treatment.
UMBELLIFERÆ. *Conium Maculatum.* Common hemlock. *Cicuta Virosa.* Water hemlock. *Œnanthe Crocata.* Hemlock dropwort. *Æthusa Cynopium.* Fool's parsley.	The symptoms produced by *conium* are, giddiness, delirium, coma and convulsions. By the *cicuta*, gastric irritation, vomiting, giddiness, profound coma and insensibility, and finally, very violent tetanic convulsions. By the *œnanthe*, burning heat in the throat and epigastrium, stupor, and in every instance violent convulsions. By the *æthusa*, nausea, vomiting, headache, giddiness, sopor, partial paralysis and numbness of the extremities, sometimes pain in the stomach, lividity of the surface, and great dyspnea have been observed.	The treatment should be the same as for the *solaneæ;* no antidote is known, though an infusion of galls has retarded their action.
RANUNCULACEÆ. *Aconitum Napellus.* Monk's head. *Helleborus Niger.* Black hellebore. *Digitalis.* Purpurea.	The symptoms produced by *aconite*, are burning heat in the throat, vomiting, purging, numbness, partial paralysis, delirium and convulsions. By the *hellebore*, vomiting, delirium and convulsions. By the *digitalis*, feeble and retarded pulse, violent pain over the eyes, confusion of intellect, extreme prostration; to which succeed profuse diarrhea, delirium, convulsions and general insensibility.	The treatment should be the same as for the solaneæ.
MELANTHACEÆ. *Veratrum Album.* White hellebore *Veratrum Viride.* American hellebore. *Colchicum.* Autumnale.	The symptoms of poisoning by these agents are, violent vomiting (sometimes of blood); tenesmus; burning sensation of the mouth, throat, œsophagus and intestines; constriction of the throat, with a sensation of strangulation; griping pain in the bowels; small, and in some cases almost imperceptible pulse; faintness; cold sweats; tremblings; giddiness; blindness; convulsions and insensibility.	The treatment for poisoning by these agents should be the same as above; emetics, however, will not have to be used. Hahnemann recommends coffee as a drink and as a clyster; astringent infusions, demulcent liquids, and opium, are strongly recommended. *Chlorine*, *bromine* and *iodine* have been recommended as antidotes to all of the *acro-narcotic* poisons.
LAGONIACEÆ. *Strychnos Nux Vomica.* *Strychnos Tieute.*	The symptoms of poisoning by the strychnia and brucia, and the agents that contain them are,	In cases of poisoning by these agents, it is recommended to evacuate the stomach by the stomach-pump or an active emetic immediately. Whether this is done or not, the

ACRO-NARCOTICS—CONTINUED.

Poisons.	Symptoms.	Treatment.
Strychnos Toxifera. Wourali. *Ignatia Amara.* St. Ignatius Bean. The active principles. *Strychnia.* *Brucia.*	a feeling weight and weakness in the limbs; trembling of the limbs, and rigidity, or slight spasms when motion is attempted; increased sensibility; the voluntary muscles are thrown into a convulsed state on the slightest motion; finally, *tetanic* spasms of the entire body are produced, which pass off, and a calm succeeds; which, however, is succeeded by more violent spasms. This continues until the violence of the paroxysm destroys life, apparently by producing a state of asphyxia.	patient should at once be made to swallow as much sweet-oil, lard-oil, lard, or other fixed oil, as the stomach will retain; at least, from two to four pints should be administered; if the stomach-pump can be obtained, the stomach may be emptied after each pint of oil taken. This has been found to be the best antidote to the poison, though *chlorine*, *iodine* and *bromine*, have been recommended. The secondary symptoms will have to be treated on general principles.

NARCOTICS.

Poisons.	Symptoms.	Treatment.
HYDROCYANIC ACID, PRUSSIC ACID.	In poisoning by hydrocyanic acid, the symptoms are: a remarkably bitter taste, sometimes described as hot; a sensation of faintness and giddiness; salivation, which is succeeded by *tetanic* convulsions and insensibility. If the quantity taken has been large, it destroys life almost immediately. If the patient recovers, its influence passes off very quickly. The whole period of suffering rarely exceeds half an hour.	There is no antidote to the action of this poison. The most important agents in the treatment of poisoning by it, or substances which contain it, are *ammonia*, *chlorine*, the cold *affusion*, and *artificial respiration*. Chlorine is the most efficient of these, in the form of chlorine water, weak solutions of chloride of lime or soda. Inhalation of liquor ammonia diluted is next in importance; the cold affusion may be used as an adjuvant.
OPIUM AND ITS PROXIMATE PRINCIPLES.	Opium or morphia, when given in poisonous doses, rarely produce their primary stimulant effects. Stupor, approaching to coma, almost immediately sets in; the breathing is slow, sometimes stertorous; the pulse is usually about ninety, weak and irregular, occasionally slow, full and strong, like the pulse of apoplexy; the muscles are relaxed; the face is pale and tranquil, sometimes tumid, suffused and anxious; the body is usually bathed in sweat. When a case of poisoning by opium terminates favorably, the patient falls into a sound sleep, lasting 24 or 36 hours; out of	In treating a case of poisoning by opium or its active principles, the first object to be attained is the evacuation of any poison that may remain in the stomach. The best means of accomplishing this, is to resort to the stomach-pump; but when this can not be obtained, an emetic of mustard; or if that does not succeed, of sulphate of zinc should be administered. It will be recollected that sometimes the stomach is so paralyzed that emesis can not be excited. The next point is to remove the drow-

NARCOTICS—CONTINUED.

Poisons.	Symptoms.	Treatment.
	which he wakes merely affected by slight nausea, thirst and vertigo.	siness and stupor: here every thing calculated to stimulate the patient should be employed, the cold affusion, cold douche, etc.; but above all, the patient should be kept constantly in motion. Driving the patient over rough roads in a wagon, he being supported on each side by an assistant, would probably be one of the best plans.
HYOSCYAMUS.	The symptoms of poisoning by hyoscyamus are, giddiness, loss of speech, great dilation of the pupil, delirium, frequently of the most violent type, and subsequently a lethargic or comatose state.	The treatment should be the same as in poisoning by opium.

INDEX.

PAGE.
Abortives 247
Absorption of Medicines............... 57
Action of Medicines on the System. 45
    When introduced into the Stomach......................... 51
Actual Cauterants... 221
Allopathia... 17
Alteratives.......................................209
    Action of.............................210
    Therapeutic Indications 212
Anæsthetics 189
    History of.............................190
    Importance of......................191
    Action of.............................195
    Contra-Indications..............199
    Local...................................201
Antipathia... 10
Antidotes 296
    Table of...............................300
Antiperiodics 207
Antacids..271
Antiseptics 234
    Tonic 235
    Stimulant..............................236
    Astringent 236
    Chemical 237
Antispasmodics 249
    Action of..............................249
Anthelmintics 264
    Action of..............................264
Antilithics 276
Aromatics..187
Art of Prescribing Medicines........ 69
Astringents 222
    Action of..............................222
    Therapeutic Application......223
Attenuants 292

Brunonian Theory......................... 20

PAGE.
Catalytics 69
Cathartics..107
    Action of..............................108
    Therapeutic Indications.......112
    Recapitulation......................125
Chrono-thermal system of Medicine. 23
Cholagogue Cathartics.................. .110
Chemical Effects of Remedies........ 46
Circumstances connected with the state of the patient influencing the Prescription of Remedies..... 80
    Age..................................... 80
    Sex 81
    Temperament 82
    Habit 82
    Idiosyncrasy 83
    Disease 84
    Climate 84
    Mode of Living.................. 85
    Mental Action..................... 85
    Previous Disease................ 86
Classification of Remedies.............. 88
    Table of................................ 89
Contra-Stimulus, Doctrine of......... 21

Demulcents 286
    Therapeutic Indications......287
Depurants, Renal.............................145
Diaphoretics 127
    Action of..............................131
    Therapeutic Indications.......133
    Recapitulation 140
Diluents 292
    Importance of......................293
Disease 83
    General Disease.................. 84
Diuretics 142
    Action of.............................144
    Therapeutic Indications.......143

PAGE.
Diuretics..142
  Recapitulation 154
Doctrine of Contra-Stimulus......... 21
Drastic Cathartics...............................110

Effects of Remedies........................ 45
  Physical 45
  Chemical 46
  Vital 47
Emetics 90
  Action of..................................... 90
  Therapeutic Indications....... 91
Contra-Indications..............................104
  Recapitulation.............................105
Emmenagogues 240
  Action of.....................................241
Emollients 289
Epispastics 216
Errhines..269
  Therapeutic Application......270
Escharotics 219
Expectorants 228
  Action of.....................................228

Forms in which Medicines are Exhibited.. 70
  Powders..................................... 70
  Pills.. 71
  Electuaries, Confections, Conserves 71
  Lozenges 71
  Extracts 72
  Proximate Principles.......... 72
  Cataplasm.................................... 73
  Ointment 73
  Cerate 73
  Plaster.. 73
  Infusion 73
  Decoction 74
  Mixture.. 74
  Tincture....................................... 75
  Sirup 75
  Fluid Extract............................... 76

General Therapeutics..................... 8
  Disease.. 34

Headland, Propositions in regard to the Action of Remedies.............. 55
Hematics, Action of......................... 66
Homeopathia 11

PAGE.
Humoral Pathology.......................... 35
Hydragogue Cathartics.....................110
Hydragogues, Renal..........................145
Hydropathy.. 26

Importance of the Cutaneous Secretion 127
Inhalations..232

Kidneys, Material excreted by.......142
  Importance of Secretion......143

Laxatives 110
Lithontriptics......................................284
Local Anæsthetics..............................201

Methods of Cure............................... 10
Miasmatic Diseases.......................... 40

Narcotics..166
  Action of.....................................167
  Therapeutic Indications.......169
  Recapitulation 175

Objects to be obtained by Combining Medicines.................................... 78
On the Mode by which the Natural Powers of the System remove Disease 42

Parts to which Medicines are applied 47
Parturients 243
  Action of.....................................245
Physical effects of Remedies......... 45
Preface 7
Prescriptions, Mode of Forming..... 76
Purgatives 110

Refrigerants 254
  Action of.....................................256
Renal Hydragogues............................145
  Depurants 145
Revulsives 214
  Action of.....................................215
Rubefacients 215

Sedatives...155
  Action of.....................................156
  Therapeutic Indications......157
  Topical Uses...............................164
  Recapitulation...........................164
Skin, Material excreted by...........123

PAGE.

Sialagogues 268
    Therapeutic Application......268
Special Therapeutics.................. 88
Stimulants...........................177
    Action of........................178
    Therapeutic Indications........185
    Contra-Indications 188
Suppurants 220

Tables of Primary and Proximate Disease 42
Therapeutics, General................. 9
    Special 88

PAGE.

Tonics...............................203
    Action of........................205
    Therapeutic Indications......206

Vesicants 216
Vis Medicatrix Naturæ................ 43
Vital effects of Remedies............ 47

Water-Cure Treatment................. 26
What is the Province of the Physician? 32
Writing Prescriptions................ 79

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